

Mark Twain National
Forest

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Road Analysis Report

Mark Twain National Forest

—Maintenance Level 3 and 4 Roads



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MARK TWAIN NATIONAL FOREST
Road Analysis Report
for Maintenance Level 3 and 4 Roads
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Executive Summary

Background

The objective of the roads analysis is to provide decision makers with critical information to manage the maintenance level 3 and 4 road system that is safe and responsive to the public, is affordable and efficiently managed, has minimal negative ecological effects on the land, and is in balance with available funding for needed management actions.

In August 1999, the Washington Office of the USDA Forest Service published Miscellaneous Report FS-643 titled “Roads Analysis: Informing Decisions about Managing the National Forest Transportation System.” In October 1999, the agency published Interim Directive 7710-99-1 authorizing units to use, as appropriate, the road analysis procedure embodied in FS-643 to assist land managers making major road management decisions.

Prior to this, in October 1998, a Roads Analysis Pilot Test was conducted on the Mark Twain National Forest as part of the pilot testing of the then proposed National Roads Analysis Process. The pilot project area covered much of the Salem and Potosi Ranger Districts of the Mark Twain National Forest.

On Jan. 12, 2001, the National Forest Service issued the final National Forest System Road Management Rule, which revised regulations concerning the management, use and maintenance of the National Forest System Transportation System. The final rule is intended to help ensure that additions to the National Forest road network are essential for resource management and use; that construction, reconstruction and maintenance of roads minimize adverse environmental impacts; and that unneeded roads are decommissioned and restoration of ecological processes are initiated.

In May 2002, the Mark Twain National Forest contracted with Meramec Regional Planning Commission in St. James, MO, to develop a Roads Analysis Report for maintenance level 3 and 4 roads in the Mark Twain National Forest. Maintenance level 1 and 2 roads within site specific projects may be informed by a mid-level or project level roads analysis. While MRPC developed and coordinated the report, MTNF staff assisted and provided key information in their particular areas of expertise.

The analysis area varied, depending upon the issues being addressed. For evaluating the role of the Forest Service road system, the areas within the Districts' congressionally designated boundaries were used. For evaluating the social effects and management of the road system, the 29 counties encompassing the Ranger Districts were used.

To better gauge public opinion on social and economic issues as they relate to the National Forest, MRPC conducted a survey of county commissions in all 29 counties covered by the Mark Twain National Forest. A survey instrument was developed in

cooperation with Forest Service personnel. A test survey was conducted, adjustments were made as needed, and the remaining 28 surveys were conducted, with the assistance of Meramec Regional Planning Commission, Mid-Missouri Regional Planning Commission, South Central Ozark Council of Governments, Southeast Missouri Regional Planning and Economic Development Commission, Southwest Missouri Council of Governments and Lake of the Ozarks Council of Local Governments.

Because of budget limitations, this report was developed using existing information, primarily with Forest GIS information, with the exceptions of new information provided by the survey of county commissions.

In addition, it was recognized that additional information and data are needed to make fully informed road management recommendations and decisions. The following information needs are identified:

- More information is needed on exactly how much sediment is produced by roads, how long the sediment is staying in the stream system before being deposited and what the effect of the sediment is on the aquatic ecosystem. Once the information is available, a more thorough analysis could be made on the impact of roads on water quality.
- Higher definition Digital Elevation Models (DEM) are needed to facilitate better analysis and identification of roads on steep slopes, which are at higher risk for surface erosion and drainage failure.
- Monitoring and evaluation of non-system road closures would provide more information about what type of closure is most successful and cost efficient, as well as a more reliable accounting of the actual miles closed.
- Better information is needed regarding recreation and forest use. Determine the long-range plan of developed recreation areas. Some may possibly be improved, while others could be permanently closed.
- Density limits need to be reevaluated and substantiated. Current methods of determining road density are questionable. Actual density limits should be based on current environmental, social, and economic factors.
- Monitor and evaluate the use of roads by OHVs in nonmotorized management areas.

Key Findings, Opportunities and Recommendations Summarized

Upon completion of this analysis, several recommendations were formulated:

- Reduce deferred maintenance backlog on level 3 and 4 roads and increase the amount of annual maintenance on roads. Additional maintenance funds will be needed to accomplish this.
- Keep to a minimum the construction of new maintenance level 3 and 4 roads. Given the current status, additional 3 and 4 level roads may be needed only if the National Forest System acquires additional land. Ongoing maintenance must be considered for any new roads constructed or improved.
- Reevaluate cooperative road maintenance deposit formula to determine whether Forest is collecting adequate funds to repair normal wear and tear on roads.
- Nominate additional Public Forest Service Roads (PFSR). Additional funding to improve these candidate roads will free up road maintenance dollars that can be spent on other Forest roads lacking annual maintenance and to reduce the deferred maintenance backlog.
- Partner with agencies addressing local, state and regional transportation needs. Provide a seamless transportation system between and amongst the various agencies.
- Ensure that existing and potential county roads within the forest have recorded deeds of easements. Identify county roads that are candidate Forest Highways.
- Improve relationship with local governments and provide more outreach to educate local elected officials about the Mark Twain National Forest, its objective, goals and opportunities.
- Continue to partner and improve relationships with law enforcement agencies to reduce crimes within the National Forest. Correct road maps and signs will improve law enforcement response to emergency situations. Correct road maps and signs will also eliminate confusion about the jurisdiction.
- Partner with agencies addressing solid waste issues in an effort to reduce illegal dumping in the Forest.
- Improve stream crossings by Forest, other federal, state, and local agency roads. Partnerships that pursue grants, agreements, and technology transfer are encouraged to reduce the amount of sedimentation reaching streams and negative impacts to aquatic species.

- Access or the elimination of access is a key concern of the public, whether at site-specific locations or identified as general forest-wide goals. At times it can be quite controversial. It is expected that the MTNF will continue to see such controversy.
- Continue and strengthen existing efforts to reduce illegal OHV use on the Forest.
- Update the Forest Plan to reflect the changing needs of road management.
- Determine the long-range plan of developed recreation areas, which may result in a change in how their access roads are managed.
- Priority for closure should be those roads or sections of roads causing the most environmental impact.

Introduction

The objective of roads analysis is to provide decision makers with critical information to develop road systems that are safe and responsive to the public, are affordable and efficiently managed, have minimal negative ecological effects on the land, and are in balance with available funding for needed management actions.

In August 1999, the Washington Office of the USDA Forest Service published Miscellaneous Report FS-643 titled “Roads Analysis: Informing Decisions about Managing the National Forest Transportation System.” In October 1999, the agency published Interim Directive 7710-99-1 authorizing units to use, as appropriate, the road analysis procedure embodied in FS-643 to assist land managers making major road management decisions.

Prior to this, in October 1998, a Roads Analysis Pilot Test was conducted on the Mark Twain National Forest as part of the pilot testing of the then proposed National Roads Analysis Process. The pilot project area covered much of the same area of the Salem and Potosi Ranger Districts of the Mark Twain National Forest.

On March 3, 2000, the Forest Service proposed to revise 36 CFR Part 212 to shift emphasis from transportation development to managing administrative and public access within the capability of the lands. The proposal was to shift the focus of the NFS road management from development and new construction to maintaining and restoring needed roads and decommissioning unneeded roads within the context of maintaining, managing and restoring healthy ecosystems.

On Jan. 12, 2001, the National Forest Service issued the final National Forest System Road Management Rule, which revised regulations concerning the management, use and maintenance of the National Forest System Transportation System. The final rule is intended to help ensure that additions to the National Forest road network are essential for resource management and use; that construction, reconstruction and maintenance of roads minimize adverse environmental impacts; and that unneeded roads are decommissioned and restoration of ecological processes are initiated. The final rule removes the emphasis on transportation development and adds a requirement for science-based transportation analysis.

Scale of Analysis

Roads analysis is an integral part of Forest, multi-forest or eco-region assessments. Broad scale issues such as habitat connectivity should be considered as well as integration with other transportation agencies’ systems and multi-year transportation plans.

Broad landscape-scale analysis will inform managers and interested parties of the strategic intent of the Forest Service road network and demonstrate the compatibility of road systems with ecological, social and economic objectives. Broad scale analysis will provide a context for finer scale analysis units, such as for watersheds; will set priorities for more detailed analysis and program planning; and will identify issues requiring further work. Roads analysis at the Forest scale is critically important as it provides a context for road management in the broader framework of managing all forest resources.

Generally, road management decision should be informed by roads analysis at a broad scale. Responsible official must choose the appropriate scale for such an analysis and the degree of detail that is appropriate and practical. Site-specific projects may be informed by a watershed roads analysis if suitable. Road analysis below the Forest scale is not automatically required, but may be undertaken at the discretion of the Responsible Official. (FSM 7712.13c)

Process

The roads analysis process, as set forth in FS-643, is a six-step process. These six steps, as outline below, guided the development of this report:

- Step 1. Setting up the analysis
- Step 2. Describing the situation
- Step 3. Identifying the issues
- Step 4. Assessing benefits, problems and risks
- Step 5. Describing opportunities and setting priorities
- Step 6. Reporting

Products

The final product of this analysis is this report, designed for decision-makers, including Forest Service personnel and the general public that documents the information and analyses used to identify opportunities and set priorities for future NFS road systems. This report includes a variety of maps, located in the appendix, as well as survey data gathered from the 29 county commissions surveyed.

Chapter 1: Setting Up the Analysis

Purpose and Products

The purpose of this step is to:

- Establish the level and type of decision making that the analysis will inform,
- Identify the geographic scale or scales for the analysis,
- Develop a process plan for conducting the analysis, and
- Clarify the roles of technical specialists and line officers in the team.

The products of this step are:

- A statement of the objectives of the analysis,
- A list of interdisciplinary team members and participants,
- A list of information needs, and
- A plan for the analysis.

Objectives of the Analysis

The objective of the roads analysis is to provide decision makers with critical information to manage the maintenance level 3 and 4 road system that is safe and responsive to the public, is affordable and efficiently managed, has minimal negative ecological effects on the land, and is in balance with available funding for needed management actions.

This roads analysis is science based. The analysts have used and interpreted relevant scientific literature in the analysis. Any assumptions made during the analysis, and limitations of the information on which the analysis is based are described. This report has received technical review from peers in various natural resource management fields.

The Road Analysis Report analyzes the extent and current condition of maintenance level 3 and 4 roads on National Forest system lands within the context of other public and private road systems and land ownership patterns. The report compares the current condition to a desired future condition to help identify the opportunities and need for change. The Road Analysis Report provides the information to develop the Forest's strategic intent for road management; that is, what will happen to balance the need for public access with the need to minimize risk to public safety and damage to natural resources.

The Road Analysis Report provides decision support to field personnel managing Forest roads and help managers address questions on maintenance level 3 and 4 road access related to ecosystem health and sustainability, commodity extraction, recreation, social and cultural values, and administrative uses.

The Road Analysis Report informs future management decisions on the merits and risks of building new roads; reconstructing, realigning, improving, or decommissioning existing roads; managing traffic; and enhancing, reducing, or discontinuing road maintenance. Decommissioning options include obliterating roads and restoring the environment, treatments to remove all hydrologic and erosion hazards, conversion of roads to trails, or simply closing roads without further physical action.

The analysis is based upon:

- Use of the best available scientific information about ecological effects of roads on terrestrial and aquatic ecosystems;
- Economics of constructing, reconstructing, maintaining, and decommissioning roads;
- Social and economic costs and benefits of roads;
- Contribution of existing and proposed roads to management objectives; and
- Survey of elected officials in the 29 counties comprising the Mark Twain National Forest.

The Road Analysis Report identifies opportunities for increasing benefits of the maintenance level 3 and 4 roads and reducing problems and risks. It provides a framework for examining important issues and developing relevant information before managers make a formal decision that will change the characteristics and uses of National Forest road networks. The analysis makes neither land management decisions nor allocates land for specific purposes because both require National Forest Management Act (NFMA) and National Environmental Policy Act (NEPA) based Forest and project planning.

Although the analysis included in the Road Analysis Report is important, additional analysis will be needed as conditions change.

Analysis Plan

An analysis of the effects of and future needs of maintenance level 3 and 4 roads is an interdisciplinary concern for the Mark Twain National Forest to address. The road analysis has been conducted by an interdisciplinary team (IDT) that include resource specialists from each relevant field and consultants with Meramec Regional Planning Commission (see Table 1.1) because roads and access are fundamentally linked to all aspects of ecosystem management. It is generally expected that road inventories and road condition assessments as identified in FSM 7712.14 would be completed at the watershed or project scale.

The science-based roads analysis process provides the Responsible Official with information needed to identify and manage a minimum road system that is safe and responsive to public needs and desires, is affordable and efficient, has minimal adverse effects on ecological processes and ecosystem health, diversity, and productivity of the land, and is in balance with available funding for needed management actions.

Roads analysis at all scales (e.g. forest, mid-level or project-level) provides information related to the significant issues identified by the line officer. The mid-level roads analysis provides a more detailed, area specific, integrated analysis than the Forest Scale. For NEPA project decisions, the roads analysis ensures understanding of project consequences on the landscape. It can be used to develop strategies to maintain or restore the sustainability of uses and outputs associated with desired future conditions. Further, it enhances the ability to estimate direct, indirect and cumulative effects. The mid-level roads analysis, in most cases, would fulfill the roads analysis requirement for multiple project-level road NEPA decisions.

According to FSM 7712.15(2), every NFS administrative unit must have a Forest scale roads analysis completed by Jan. 13, 2003. (Note: FSM 7712.15(2) (c): Forest Supervisor may request approval from the Regional Forester for an extension.)

FSM 7712.12 states that when proposed road management activities (road construction, reconstruction and decommissioning) would result in changes in access, such as changes in current use, traffic patterns and road standards, or where there may be adverse effects on soil and water resources, ecological processes or biological communities, those decisions must be informed by roads analysis (See FSM 7712.1). Site-specific projects may be informed by a (midlevel) roads analysis if the Responsible Official determines that the scope and scale of issues under consideration warrants such use.

Line Officers Discretion: According to FSM 7712.13 c, roads analysis below the forest-scale is not automatically required, but may be under taken at the discretion of the Responsible Official. When the Responsible Official determines that additional analysis is not needed for a project, the Responsible Official must document the basis for that conclusion.

The Road Analysis Report will help to identify changes to National Forest transportation systems that may be needed to meet current or future management objectives. The six steps of road analysis include:

- **Step 1:** Setting up the analysis.
- **Step 2:** Describing the situation.
- **Step 3:** Identifying the issues.
- **Step 4:** Assessing benefits, problems, and risks.
- **Step 5:** Describing opportunities and setting priorities.
- **Step 6:** Reporting.

Although the analysis consists of six sequential steps, the process may require feedback and iteration among steps over time as the analysis matures and new information becomes available; as management needs, ecological conditions, or social issues change; as major disturbances occur; as inventory, monitoring, or research results are revealed; or as regulatory requirements are changed.

Step 1: Setting up the analysis.

The analysis has been customized to local situations; landscape and site conditions combined with public issues, Forest Plan land allocations, and management constraints. The analysis products demonstrate how well existing and planned roads meet their intended purposes and the degree to which they can affect ecological, social and economic conditions.

The road analysis documented in the Road Analysis Report encompasses lands within the boundaries of the Mark Twain National Forest in 29 Missouri counties. (See Map 1-1)

Step 2: Describing the situation.

The next task of the IDT was to describe the existing road system in relation to Land Resource Management Plan direction. This required a description of the road system, its location, ownership and condition. A description of the physical, biological, social, cultural, economic and political aspects of the analysis area was also needed.

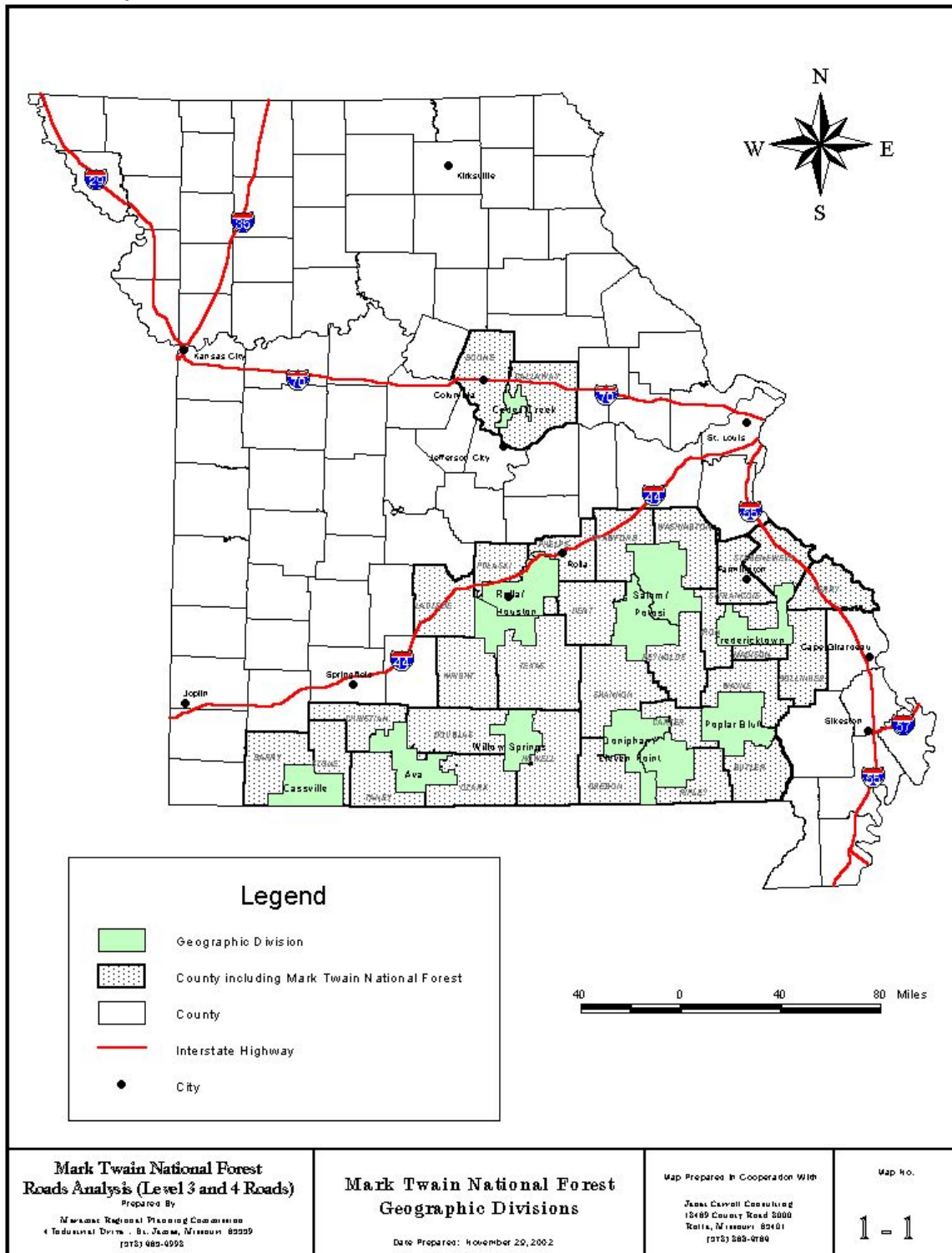
Step 3: Identifying the issues.

Issue identification was done through IDT discussion and debate, and a survey of county commissions conducted in October and November 2002 in 29 Missouri counties. Public participation, especially survey data from the 29 county commissions, was used whenever appropriate during the analysis, in steps 3 through 6. The Forest leadership team and resource specialists also reviewed and commented on the draft report. The IDT identified key issues affecting road-related management, which would drive the analysis using this process.

Step 4: Assessing benefits, problems, and risks.

In this step the IDT systematically examined the major issues and effects of the road system to generate the information baseline against which the existing and future road system could be compared. The main element of this step was to assess the various benefits, problems and risks of the current road system and whether the objectives of the Forest Service road management policy and Forest Plan are being met. This is the phase of the analysis in which the effect of roads on various social, economic, and natural resources were addressed. These road-related questions were addressed with the use of maps, GIS queries, tables and other information displays that contribute to understanding the benefits, needs, risks and effects of roads.

Map 1-1
Road Analysis Area



Step 5: Describing opportunities and setting priorities.

The IDT identified management opportunities, established priorities and formulated technical recommendations for the existing and future road system in Step 5 that responded to the issues and concerns, benefits, problems and risks identified in the preceding steps. The objective was to compare the current road system with what is desirable or acceptable, and describe options for modifying the road system that would achieve these desired conditions.

Step 6: Reporting.

The IDT reported the conclusions of the analysis, and the process by which these findings were arrived at in the Road Analysis Report. The findings are displayed with descriptions, maps, tables and graphs in the analysis.

The Road Analysis Report is a framework for periodic reevaluation of road systems and road management strategies. In the future the Forest may choose to revisit the analysis as new information becomes available; as management needs, ecological conditions, or social issues change; as major disturbances occur; as inventory, monitoring, or research results are revealed; or as regulatory requirements are changed. The IDT should compare actual outcomes against interpretations and effects made in earlier iterations.

Interdisciplinary Team Members and Participants

The IDT that conducted the analysis and prepared the Road Analysis Report was staffed with appropriate technical experts from the Forest and Ranger Districts along with consultants from the Meramec Regional Planning Commission. This structure provides effective integration of technical and policy roles in the conduct of the analysis. IDT members responsible for various elements of this analysis include:

Table 1.1 Road Analysis Interdisciplinary Team Members		
Team Member	Discipline	Responsibilities
John DePuy, MTNF	Soil Scientist	Geology, soils
Mary Lane, MTNF	Wildlife Biologist	Wildlife, TES
Karen Mobley, MTNF	Land Use planner	Core Team Responsibilities, Ecosystems
Amy Sullivan, MTNF	Transportation Planner	Core Team Responsibilities
Lori Wilson, MTNF	Hydrologist	Water/Aquatic
Larry Furniss, MTNF	Fisheries Biologist	Aquatic Species
Richard Cavender, MRPC	Economics, Public Policy, Planner	Core Team Responsibilities
Bonnie Prigge, MRPC	Communication, Planner	Core Team Responsibilities, Social Issues, Passive Use, Water Production, Report Coordination
Tammy Snodgrass, MRPC	Environmental Specialist	Terrestrial Protection, Timber Management
Connie Willman, MRPC	Economic Development Planner	Economics, Recreation, Mapping, GIS Queries, Civil Rights, Environmental Justice, Survey Coordination
Kelly Sink-Blair, MRPC	Transportation Planner	Public Transportation, Mapping, GIS Queries, Special Use Permits
Nongluk Tunyavanic, MRPC	Community Development Specialist	Current Situation, Minerals Management, Range Allotment, Administrative Uses, Special Forest Products
Janet Carroll, MRPC	Mapping Consultant	Mapping
Margaret Olson, MTNF	GIS Specialist	GIS support

Working in cooperation, technical experts and consultants provided facts, processes and technology, such as,

- Existing conditions on the national forest;
- Processes by which roads exert physical, biological, social and economic effects;
- Technology that might be used for modifying effects, and;
- The relative cost-effectiveness of alternative actions that management might prescribe.

The Responsible Official, after consulting technical information, laws, policies and the needs of the public may now make judgment values, such as:

- Which conditions, effects, technologies, and management actions are desirable or undesirable;
- What priorities to establish;
- What conditions or effects create unacceptable risks;
- What are the appropriate management objective and criteria;
- When and how to include public participation in decision processes; and
- Allocation of agency resources.

Available Information

There is less than complete knowledge about many of the relationships between roads and conditions of wildlife, fish, forests, hydrology, economics and social needs in the analysis area. The ecology, inventory and management of a large forest management area is a complex and developing science. The biology of wildlife and aquatic species prompts questions about population dynamics and habitat relationships. The interactions of resource supply and demand, the economy and community dynamics is the subject matter of an inexact science.

The IDT examined the data and interrelationships used to estimate the effects and risks involved in managing the area's transportation system. The data and level of analysis used were commensurate with the importance of the possible impacts. Relevant discussion in the *Land and Resource Management Plan Mark Twain National Forest* (FOREST PLAN) and the *Ozark-Ouachita Highlands Assessment* (OOHA) are incorporated by reference. The results of the *Mark Twain National Forest Salem and Potosi Ranger District Road Analysis Pilot Test*, October 1998, and the *Salem/Potosi Ranger Districts Oak Decline and Forest Health Project Roads Analysis*, December 2001 which overlapped our analysis area, were also available and incorporated into the Road Analysis Report.

When encountering information gaps, the IDT concluded that obtaining the missing information might have added precision to estimates or better-defined relationships. However, the basic data and central relationships are sufficiently well established in the respective sciences and additional information would be unlikely to reverse or nullify understood relationships. While additional information would be welcomed and allow more detailed site-specific recommendations to be made, it is not essential to a reasoned choice among the recommendations as they are presented.

Chapter 2: Describing the Situation

Purpose and Products

The purpose of this step is to describe the existing maintenance level 3 and 4 road system in relation to current Forest Plan direction.

The products of this step are: 1) maps or other descriptions of the existing road and access system defined by the current Forest Plan or transportation plan, and 2) basic data needed to address roads analysis issues and questions.

Descriptions of the existing road and access system

The Analysis Area: The area addressed in this roads analysis is not a contiguous land unit. In 1933, Missouri passed legislation permitting the establishment of National Forest in the state. During 1934 and 1935, eight separate purchase units were established. Bankrupted farmers and defunct lumber companies sold blocks of unwanted and cut over land to the Forest Service. By the start of World War II, slightly more than 1,252,000 acres had been approved for purchase. Today Mark Twain National Forest (MTNF) covers 1,494,042 acres of National Forest System land. The MTNF spreads across southern Missouri. It extends throughout the Missouri Ozarks encompassing an area of 285 miles east to west and 100 miles north to south. In addition, one unit is located north of the Missouri River in central Missouri. The MTNF is divided into 13 units, located in nine congressionally designated boundaries that are managed as six administrative units called Ranger Districts. Overall MTNF direction is provided through the Forest Supervisor's Office in Rolla, Missouri. The congressionally designated boundaries are Ava, Cassville, Cedar Creek, Doniphan-Eleven Point, Fredericktown, Houston-Rolla, Poplar Bluff, Salem-Potosi and Willow Spring (see Map 1-1). This is the only national forest in Missouri and its lands are located within the following 29 counties: Barry, Bollinger, Boone, Butler, Callaway, Carter, Christian, Crawford, Dent, Douglas, Howell, Iron, Laclede, Madison, Oregon, Ozark, Phelps, Pulaski, Reynolds, Ripley, St. Genevieve, St. Francis, Shannon, Stone, Taney, Texas, Washington, Wayne and Wright. The MTNF is located within the third, fourth, seventh, eighth, and ninth U.S. congressional districts.

The MTNF has seven designated wilderness areas under the provisions of the Wilderness Act of 1964, totaling approximately 63,400 acres. These wilderness areas are Hercules Glades in Taney County (12,314 acres), Bell Mountain in Iron County (8,977 acres), Piney Creek in Barry and Stone Counties (8,112 acres), Rock Pile Mountain in Madison County (4,089 acres), Devil's Backbone in Ozark County (6,595 acres), Paddy Creek in Texas County (7,019 acres), and Irish in Oregon County (16,277 acres). These wilderness

areas are allocated under management prescription 5.1 in the Forest Plan (See Maps 3-1 through Map 3-9) .

Millions of people reside within a day's drive of the MTNF. According to the 2000 census, the St. Louis Metropolitan Statistical Area (MSA) with a population of 2,003,762 and the Springfield MSA with a population of 325,721 are located at the northeast and southwest ends of the MTNF respectively. They are within an hour's drive or less. The Columbia MSA, population 135,454, is half an hour northwest of Cedar Creek Ranger District. The Kansas City MSA, population 1,070,052, lies 180 miles to the northwest. The Memphis, TN, MSA, with 977,549 people is located about 170 miles southeast. Access is good from population centers to all parts of the MTNF.

MTNF is located in the transition zone of several major ecological plant associations. The oak-hickory-pine, cedar glades, southern floodplain forest and the bluestem prairie all are found within the Forest. Not only must this diverse vegetation be recognized, but the effects of management activities on it must be understood. Managing this complex situation demands diverse methods and ecologically sound vegetative management techniques. Habitat requirements of many of the 750 species of animals native to Missouri are considered and safeguarded.

MTNF contains a high concentration of Missouri's more popular float streams, such as the Eleven Point, Big Piney, St. Francis, Courtois Creek, Huzzah Creek, Black River, Roubidoux Creek, Gasconade River, White River and the Ozark National Scenic Riverways, which includes portions of the Current and Jack's Fork rivers. Seven of the eight Wilderness areas in Missouri, the Ozark Trail system and many other unique features are also located within MTNF boundaries. For FY 2001, there were 2,400,000 recreation visitor days (RVDs) for recreation use excluding recreation in the wilderness areas or wildlife related use such as hunting and fishing, which accounted for another 56,000 RVDs (1 RVD=12 hours of recreation use).

The MTNF is the largest single ownership of 10 percent of forested land and contributes 5% of the total timber product produced in the State of Missouri. The amount of timber sold for the past 10 years declined from a high of 63.3 million board feet (MMBF) in 1993 to 16.1 MMBF in 2001. However, in 2002, 50.8 MMBF of timber was sold, and this amount is expected to remain stable.

Improving the quality of timber on National Forest lands is one of the goals of forest management. Timber stand improvement (TSI) is usually done in young timber stands by thinning and removing unwanted trees. This allows the remaining trees to grow healthier and more vigorous. TSI was completed on 2,689 acres in FY 2001, a 50 percent increase over FY 2000. In addition, 5,613 acres of land were reforested allowing sprouting from stumps of harvested trees, leaving selected trees during harvesting to provide a seed source and planting pine seedlings.

The interspersed military and National Forest lands within the boundaries of Fort Leonard Wood requires cooperation with the U.S. Army. Coordination with the Missouri

National Guard (MONG) is required for National Forest lands used for National Guard training. The Guard's Wappestello training site is located on the Poplar Bluff Ranger District.

The Viburnum Trend, the premier area for U.S. lead mining and milling, is located mostly within the Forest. It produces about 90 percent of the national annual lead ore production. Over 50 percent of this annual production comes from federally owned minerals on the Forest. All facilities and above ground developments that support mining are found on private land, the exception are about 3 acres of NFS lands where vent shafts are located. However, the income from mineral royalties on the MTNF has been declining. According to the MTNF annual reports, the income from minerals was \$4,405,516 in 1999; \$3,631,000 in 2000 and \$2,400,000 in 2001. The future of such income is uncertain, depending on the market for lead.

There are several management problems associated with the roads network on the MTNF lands. Examples of these include illegal activities such as unauthorized use of vehicles in prohibited areas, theft of forest products, trash dumping, arson, poaching, possession of illegal drugs and alcohol, illegal drug manufacturing, growing marijuana and vandalism. However, data on specific location and the extent of these problems are limited.

There is a noticeable trend of more people wanting to live within or adjacent to the MTNF. Some communities near the MTNF are experiencing accelerated growth which is resulting in private property within the forest being developed. With development, there has been an increase in the amount of traffic from individuals traveling to and from their homes or places of employment. It is National Forest policy to pursue turning over jurisdiction of forest roads that receive non-forest traffic to the local county. During the last decade, over 100 miles of road easements have been granted to counties.

Existing Road and Access System: The transportation system in the MTNF includes a network of public and private roads and trails, rail-lines, waterways, pipelines and utility rights-of-way. When the Forest Service purchased the lands, the existing road system came with these lands. The National Forest System roads serve a wide variety of resource management and access needs of recreation, timber, range, minerals, water production, geology, general multiple use and private property for economic, social and natural resource reasons.

Because the primary transportation system is largely in place, more roads are reconstructed than constructed. Reconstruction costs have risen over the past several years. The annual budget for road construction, reconstruction and maintenance has been relatively stable, but due to inflation, fewer projects are being funded. State, county and forest roads are maintained by each jurisdiction within the MTNF. Special use permit holders are responsible for the maintenance of permitted non-system Forest Service roads whether they are open to the public or not.

Many of the issues concerning road management on the MTNF involve unclassified roads. These typically are historic roads that were constructed or developed through use

before the land was incorporated into the National Forest system. These roads were identified as not needed for Forest Service management, and are not maintained. According to MTNF Land and Resource Management Plan, all non-system roads are to be closed. Normally these closures occur when project-related temporary roads in the area are closed upon completion of management activities.

As noted in the Record of Decision for the MTNF Land and Resource Management Plan, people hold different opinions regarding management of these non-system roads. A common opinion is that continued use of these roads is an environmental threat, due primarily to soil damage and erosion. Associated with this opinion is the belief that National Forests should be managed to provide natural conditions with limited or no access. At the opposite end of the spectrum are those who do not believe that use of these non-system roads incurs any significant negative environmental impacts. In addition, many people believe that access to the Forest should not be restricted, and that the use of these roads has become their right. Some also question the Forest's legal authority to close some of these roads.

Road closures have been an issue for local residents in particular. In 1988, the Mark Twain National Forest solicited public comment on Forest road management. A public meeting, held in Potosi, Missouri, drew negative responses to the proposal from between 350 and 400 people attending, including a state representative and a state senator. It was clear from public response at the meeting that the attendees strongly believed their right of unlimited access to the National Forest was being threatened. The public perception is that much of the Forest road system was built in the 1930s as fire prevention and forest access trails. Many of the roads proposed for closing were through roads or loop roads. These roads were targeted for closure because they were often used by poachers, arsonists and people dumping trash. Many people, however, were particularly upset that these loop roads would be eliminated, forcing them to drive in and out of an area using the same route.

Between 1986 and 1998, the Mark Twain National Forest received 11 congressional inquiries dealing with road management. Of these, six resulted from the Forest's denial of special use permits; two complained that road conditions were too rough for a school bus to negotiate; two objected to road closures; and one objected to the reconstruction of a road. This particular reconstruction proposal resulted in 69 identical letters to the District Ranger opposing the reconstruction on the grounds that it would lead to increased poaching, trespassing and abuse of adjacent private property, would harm wildlife habitat and would make it more difficult for law enforcement officers to patrol the area.

Of the six road-related congressional inquiries received prior to 1986, four complained about road conditions, especially the lack of maintenance and snow removal; two objected to road closures associated with the Eleven Point Scenic River, and one objected to paying a special use fee for "a road that already exists and is on public land." At the district level, road issues, involving access and closure are probably among the highest number of calls and complaints received. Particularly during high recreation periods,

such as hunting seasons, many road issues surface and are points of contention for the public.

In the Roads Analysis handbook FS-643, the following definitions are provided:

- Road: A motor vehicle travel way over 50 inches wide, unless designated and managed as a trail. A road may be classified, unclassified, or temporary.
- Classified Road: Roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long term motor vehicle access, including state roads, county roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service.
- Public Road. Any road or street under the jurisdiction of and maintained by a public authority and open to public travel (23 U.S.C. 101[a].)
- Private Road. A road under private ownership authorized by an easement to a private party, or a road that provides access pursuant to a reserved or private right (unchanged from Roads Analysis).
- National Forest System Road. A classified forest road under the jurisdiction of the Forest Service. The term “National Forest System roads” is synonymous with the term “forest development roads” as used in 23 U.S.C. 205.
- Unclassified Road: Roads on National Forest System lands that are not managed as part of the Forest transportation system, such as unplanned roads, abandoned travel ways and off-road vehicle tracks that have not been designated and managed as a trail, and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1).
- Temporary Roads: Roads authorized by contract, permit, lease, other written authorization or emergency operation not intended to be a part of the Forest transportation system and not necessary for long-term resource management.
- New Road Construction: Activity that results in the addition of Forest classified or temporary road miles (36 CFR 212.1).
- Road Decommissioning: Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36CFR 212.1, FSM 7703).
- Road Maintenance: The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective (FSM 7712.3).
- Road Reconstruction: Activity that results in improvement or realignment of an existing classified road as defined below:
 - Road Improvement - Activity that results in an increase of an existing road’s traffic service level, expansion of its capacity or a change in its original design function.
 - Road Realignment - Activity that results in a new location of an existing road or portions of an existing road and treatment of the old roadway (36 CFR 212.1).
- Roads Subject to the Highway Safety Act: National Forest System roads that are open to use by the public for standard passenger cars. This includes roads with access restricted on a seasonal basis and roads closed during

extreme weather conditions or for emergencies, but which are otherwise open for general public use.

- Forest Transportation Atlas: An inventory, description, display and other associated information for those roads, trails and airfields that are important to the management and use of the National Forest System lands or to the development and use of resources upon which communities within or adjacent to the National Forest depend.

In addition, the following terms are found in this analysis and their definitions are provided:

- Woods Road. A woods road is part of the permanent transportation system of the MTNF. It is an unimproved local road that may be used to accommodate motorized recreation traffic or for transporting forest products. This type of road is maintained only to prevent resource damage. Its maintenance level will be greater than 1 but less than 2 (Source: Forest Plan).
- Road Maintenance Level. Roads under the jurisdiction of the Forest are assigned a maintenance level. Maintenance level defines the service provided and the maintenance required for the specific road. Factors used to determine a road's maintenance level include, but are not limited to, resource management needs, service life, user safety, volume and type of traffic, surface type, and user comfort and convenience. The Forest utilizes the following road maintenance level definitions (Source: INFRA Travel Routes, version 5.0.1):
 - Maintenance level 1 – Basic custodial care (closed)
 - Maintenance level 2 – High clearance vehicles
 - Maintenance level 3 – Suitable for passenger cars
 - Maintenance level 4 – Moderate degree of user comfort
 - Maintenance level 5 – High degree of user comfort

These Road Management objectives are to:

1. Establish the specific intended purpose of a road based on management needs as determined through land and resource management planning.
2. Contain operation and maintenance criteria for existing roads.
3. Contain design criteria and operation and maintenance criteria for new roads.

There are currently 10,069 miles of classified roads on all land within the MTNF, of which 4,354 miles are on National Forest System land. Some 69% (6,980 miles) are public classified road within MTNF boundaries (See Table 2.1). Public classified roads are managed and maintained for public use. These roads receive the highest traffic and are the most costly to maintain to standard. NFS roads are maintained to varying standards depending on the level of use and management objectives.

Roads with an assigned maintenance level 3, 4 or 5 provide access for passenger car traffic and make up the backbone of the Forest transportation system. These roads are the

focus of this analysis. Maintenance level 1 and 2 roads will be analyzed at the project level during proposed NEPA activities. Federal, US and State highways are maintained at level 5 and County roads at level 3 with a few at level 4 or 5. Eighty percent of Forest Service roads are maintained at level 2 and twenty percent are either at level 3 or 4. No MTNF roads are assigned maintenance level 5. Private roads are generally maintained at level 2 or 3. Table 2.1 summarizes the jurisdiction of MTNF roads and their maintenance levels. The following road miles are calculated from the Forest Service's GIS road data as of November 2002.

Table 2.1: Jurisdiction and maintenance level of classified roads within MTNF.

Note: First number is total miles of each road class on all land within MTNF boundary. Number in parenthesis is total miles of each road class on National Forest System land.

Jurisdiction	Mileage	Maintenance Level
Public roads:		
Federal, US & State highways	1,529 (549)	5
County roads	2,977 (1,241)	3, 4, 5
Township roads	51 (-)	3, 4
FS roads	2,416 (2,354)	2, 3, 4
COE roads	3 (3)	3, 4
MDC roads	4 (-)	3
Private roads	3,089 (207)	2, 3
Total classified roads	10,069 (4,354)	2, 3, 4, 5

Source: GIS query by MRPC using MTNF GIS information, November 2002.

The total mileage for Forest Service roads shown above (2,416) is based upon information in the Geographic Information System (GIS) roads layer. It is noted that this number differs from the total road miles shown in Table 3 (2,608) from the Forest Plan. It is unclear why the GIS layer shows fewer miles than on the Forest Plan Transportation map, especially since road construction was such a small part of the road system. One possible reason is that the Forest has transferred jurisdiction of over 100 miles to counties and land exchanges with Fort Leonard Wood have also reduced the number of Forest Service roads, and while this is reflected on the GIS layers, it has not been documented in the Forest Plan.

The Forest Plan includes density standards for each of the specific management area prescriptions. Most of the management areas allow up to two miles of Forest Service system roads per square mile of National Forest land. The semi-primitive motorized prescription 6.2 allows one mile of Forest Service system roads per square mile of National Forest land and two management prescriptions allow only temporary roads (5.1

and 6.1). Under these management prescriptions, only Forest Service classified roads and Forest Land listed in the Automated Land Program (ALP) are used in determining the density. No unclassified roads, private roads or roads under the jurisdiction of another agency (federal, state, county or town) are included (bold number in parentheses under classified FS roads in Table 2.2). It is to be noted that Ava, Cassville, Doniphan, Fredericktown, Rolla, Potosi and Willow Spring units have designated Wilderness areas under management prescription 5.1.

Desired Road System Conditions

The desired condition is to provide a road system that is safe, affordable, has minimal ecological impacts and meets immediate and projected long-term public and resource management needs. Resource management needs are largely based upon current Forest Plan direction, including management area prescriptions. Current Forest Plan transportation system goals (Forest Plan IV-3) include:

1. Schedule the development of the proposed transportation system which provides the minimum permanent road access and development standards while meeting resource management objectives.
2. Provide for temporary access to complement the permanent road system for effective resource development.
3. Recognize and provide for off-road vehicle use in a manner that protects the resource and complement other management programs.
4. Close unnecessary roads.

The Forest Plan describes the transportation system as being developed and maintained at the minimum standard necessary to meet management area objectives, provide for motorized recreation use, reduce forest user conflicts and allow for forest product transportation, while minimizing resource damage and protecting the road investment. Special use permits may be authorized for access across National Forest land to private property on non-system roads. Roads that generate non-forest traffic will be maintained by the respective authority. Non-system roads will be closed unless they are under a special use permit. A road closed after resource activities are accomplished will be revegetated.

The Plan reflects transportation system analysis based on management area allocations. Emphasis is on developing only those roads that are essential for resource management. Road development standards are at minimum acceptable levels for intended use. The Plan provides for a permanent road network of 2,608 miles, of which 472 miles remain to be developed. Of this remaining mileage, 426 miles will consist of upgrading present unimproved routes. New road construction will only involve 46 miles. This network includes 879 miles of unimproved roads retained at standards sufficient for off-road vehicle use and resource protection (Table 2.2). It should be noted that terms used in the Forest Plan differ from those in this roads analysis. For a definition of these terms, please refer to the glossary in the Forest Plan.

Table 2.2. Road network mileage projected as updated by Forest Plan amendment #28, August, 2002.

Unit	Existing roads at standard	Existing roads to be upgraded to standard	New Road construction on undisturbed location	Unimproved woods roads to be retained	Total permanent road system
Ava	39	16	5	183	243
Cassville	18	47	-	114	179
Cedar Creek	3	-	-	2	5
Doniphan	140	32	-	56	228
Fredericktown	67	2	6	28	103
Houston	57	13	4	46	120
Poplar Bluff	191	73	9	76	349
Potosi	170	36	2	66	274
Rolla	63	25	5	66	159
Salem	222	51	5	64	342
Van Buren	95	28	-	49	172
Willow Springs	56	72	5	33	166
Winona	138	31	5	94	268
Total	1,259	426	46	879	2,608

Source: Forest Plan

Maintenance Level 3 and 4 roads primarily fall under the first column in Table 2.2, though mileages are not broken out or tracked by road maintenance levels. “Generally all arterial and collector roads are in place.” (Forest Plan IV-84).

Road network density and development standards vary by management prescription. All permanent roads included in the Forest transportation system will be open to public motor vehicle use unless closed for a specific management reason. Transportation planning in all management areas places greater emphasis on coordination of skidding distances and the use of temporary roads (Forest Plan III-4). According to the MTNF Land and Resource Management Plan, there are 12 broad management prescriptions. These management prescriptions achieve a desired future forest condition with resulting outputs of goods, services, uses and environmental enhancements. Each management prescription has the transportation system goals for the included management areas:

Management Prescriptions 3.1, 3.2, 3.3, 3.4, 4.1, 4.2.

Provide on the average up to two miles of permanent roads per square mile of National Forest System land. This density will include unimproved woods road mileage and could also include up to one mile of arterial or collector road.

Management Prescription 5.1.

Roads will not be provided, except as required by the act establishing the wilderness. Maintenance of authorized roads will be at the minimum level necessary to protect the resource and accommodate the authorized use.

Management Prescription 6.1.

- Permanent roads will not be provided except as follows:
 - The Loving Ridge Road in the Swan Creek area will be retained as an unimproved road to provide for high water access to adjoining landowners and traditional use.
 - A road as shown on the Forest Plan Transportation Map will be retained as an unimproved road providing traditional access to the North Fork area (Steam Mill Hollow).
 - An unimproved road will be retained to provide traditional river access to the west side of the river in the North Fork area (see transportation map).
 - A road will be retained to provide access to the Carroll Cemetery in the Spring Creek area.
- These exceptions to road closure will be reevaluated the next plan period (10-15 years) to determine if they should remain open.
- Existing permanent and unimproved roads will be closed and allowed to revegetate except as note above.
- Revegetation of closed facilities will be accomplished within one year after termination of contract, lease, or permit of the project.
- The transport of Forest resources will be on a road network developed around the use of temporary roads.
- Develop temporary roads primarily on in-place routes to a minimum standard so as to exert only a subtle effect on the landscape and to facilitate their subsequent closure.

Management Prescription 6.2.

- Provide on the average up to one mile of permanent roads per square mile of National Forest System land. Unimproved woods road mileage will be included in the density objectives.
- Limit public motorized use of the permanent road network only as needed to meet specific management area needs.

Management Prescription 6.3.

- Construction and reconstruction of roads is prohibited except for use that is permitted by the National Scenic River Act.
- Access identified on the Forest Transportation Map will be maintained but not enhanced beyond the current (1986) conditions or the standards identified for the designated objective.
- Road construction will be limited to temporary roads at the minimum development level for resource management needs.

Management Prescription 8.1.

Provide only those local and temporary roads needed to comply with special area management objectives.

- Eleven Point National Scenic River-44.4 miles. Public motorized access is restricted to the designated routes within the National Scenic River Area, as listed in the Regional Forester's Closure Order of August 29, 1983.
- Fort Davidson-14.72 acres. The transportation system is that identified on Forest Plan transportation maps. System roads may be constructed or maintained across the trail.
- Lower Current River-Forest special area, approximately 2,040 acres NFSL, total river length 16 miles. The Forest Service road system permitted within this special area is shown on the Forest Plan map. All other existing roads on National Forest lands unless authorized by a special use permit or outstanding right will be closed.

Management Prescription 9.1.

- Permit local roads as needed for access to adjacent management areas, private ownerships or to protect resources.
- All existing unimproved roads will remain open unless causing resource damage.

Basic Data Needed

Basic data needed for the MTNF maintenance level 3 and 4 road analysis are those that directly and indirectly answer the questions listed in the roads analysis handbook FS-643. Some of the data are displayed in this report, and other data are used to help answer questions in Step 4 .

- GIS layer of roads
- GIS layer of streams
- GIS layer of lakes
- GIS layer of range allotments
- GIS layer of wilderness areas
- GIS layer of mineral areas
- GIS layer of recreation areas
- GIS layer of landownership
- GIS layer of Ranger District boundaries
- GIS layer of cities
- GIS layer of county boundaries
- GIS coverage and mapping of critical, unique or sensitive wildlife habitats.
- INFRA Travel Routes (Version 5.0.1) database containing an inventory of forest roads and their maintenance level, surface type, functional class, features, maintenance needs, and other information.
- Identification of illegal ORV use and trash dumping sites.

- Identification of wildlife species most at risk from roads, whose viability is a concern.
- Identification of wildlife habitat management needs facilitated by the existing road system.
- Identification of noxious and invasive weeds.
- The location of roads relative to riparian boundaries and the intersections that influence riparian vegetative communities.
- Identification of non-native wildlife species and methods of management or eradication of these species.
- Identification of types of illegal activities.
- Surveys of county officials.

Chapter 3: Identifying Issues

Purpose and Products

The purpose of this step is to:

- Identify key issues affecting road-related management, and
- Describe the origin of the issues.

The products of this step are:

- A summary of key road-related issues, including their origin and basis, presented by general categories of environmental, social/cultural and economic, and
- A description of the status of current data, including sources, availability, and methods of obtaining information.

Issues Summary

Issue 1. Counties and MTNF need to work cooperatively in identifying and numbering Forest Service roads so that one road does not have two numbers and to avoid confusion as to who has responsibility for the road.

With many rural counties establishing 911 systems, many have numbered roads to improve emergency response capabilities. In some situations, counties have assigned new county road numbers to Forest Service roads, thus creating public confusion as to the correct road number and actual ownership of the road.
(Issue identified by FS road managers)

Issue 2. Adequate roadways are needed to assure access to commodities, especially logging, to ensure stable economies. It is important to maintain adequate access for vegetation management.

A major issue is public access to National Forest system lands. National Forest system roads are a primary means by which commodities, especially timber, are removed from the Forest, and they are the means by which forest vegetation is managed. Adequate access is needed to manage timber for both commercial and non-commercial uses. A number of counties within the forest depend on the timber industry for a stable economy.

National Forest land managers will need continued road access in the future to manage vegetation throughout the analysis area. Road access is needed for continued improvement and maintenance of wildlife habitat, reforestation, timber stand improvement, noxious and invasive weed control and open land

maintenance. Some hold the opinion that there should be less vegetation management of the forest, therefore fewer roads and less access.

Access will need to be maintained for other resources as well, such as recreational facilities, grazing allotments, wildlife areas, etc. (Issue identified by county commissions survey.)

Issue 3. The federal government needs to re-evaluate Payment-In-Lieu-of-Taxes (PILT) payments, especially the formula used.

Counties receive two forms of funding to help finance road management, based on the land base and resources of the National Forest. Both types of funding are discussed below.

County governments do not receive property taxes on National Forest Service land and instead receive payments-in-lieu-of-taxes. The amount received varies from year to year. Congress determines the amount of these payments annually. Counties have complained about the discrepancy between PILT payments and the taxes that could be collected if the land were privately owned. Each county receives an estimated \$2.10 per National Forest System acre if they have selected the secure payment.

Counties also receive 25 percent of Forest revenue where National Forest land is located. The amount is prorated, based on the number of National Forest acres in the county. These funds are used to benefit public schools and county roads. In fiscal year 2001, the "*Secure Rural School and Community Self-Determination Act of 2000*" took effect. Counties could choose to take the average of the three high years since 1986 or continue to receive the standard 25 percent of revenues. The three high years for the MTNF were 1988, 1989, and 1990. During these three years, royalties from mining mineral were included in the Forest revenue and these revenues were very high. All but five of the counties within the Forest are using the average of the three high years. Using the high three years average eliminates the risk of fluctuating demand and market prices. The following counties are not participating in this program: Barry, Bollinger, Boone, Laclede and St. Francois. (Issue identified by county commissions survey.)

Issue 4. Maintenance of roads needs to be improved.

The Forest Service road maintenance budget appears inadequate to maintain the existing road system at optimum level. Asset management studies indicate it is less costly to maintain roads on an ongoing annual basis as opposed to allowing them to reach a certain point of deterioration over time and then trying to improve them to an optimum level. Special consideration should also be given to the construction of new roads and whether the long-term maintenance expense is one the Forest Service can afford. (Issue identified by FS managers and public comments and inquiries.)

Issue 5. The affect of county and private road management on water quality and aquatic resources must be considered.

County and privately owned and managed roads make up 58 % of the total road network within the National Forest boundary. Standards for construction and maintenance of these roads are generally limited. Almost all of these roads are native material or aggregate surfaced. They lack adequate drainage structures and are not regularly maintained. There is a general perception by professional natural resource managers that poor road maintenance practices on these county and private roads, along with their poor locations, contribute significantly to water quality and aquatic habitat degradation in their watersheds. Many of these county roads are historic legacies, which never were constructed and designed to current highway standards.

As nonpoint pollution continues to be the largest problem in improving and maintaining water quality standards across the nation, the effect of sediment deposition from roadways into area streams is of major concern. Numerous studies show that road systems have a major impact on the volume of sediment flowing into streams and waterways. A study conducted by researchers at the Coweeta Hydologic Laboratory in North Carolina came to several conclusions on this topic. Researchers measured the concentration of sediment in run-off from several different types/conditions of roads. They found that the movement of sediment varied widely but was affected by the levels of maintenance on the roads and road drainage. They found that roads that had been constructed and maintained using Best Management Practices (BMPs) to prevent or minimize the effect of forestry activities on water quality showed the lowest level of sediment deposition. However, in areas where installed BMPs failed—either due to lack of maintenance or improper installation—sediment concentrations were similar to those associated with other gravel surfaces. In addition, this study found that sedimentation concentration decreased with the distance water traveled from road to stream. This reinforces the opinion that roads should be constructed where drainage is not adjacent to water courses and drainage systems should be constructed to minimize water volumes and slow down water flows. (Issue identified by FS managers.)

Issue 6. Road access must be maintained for law enforcement and emergency services response.

As more people use Forest Service lands, the need for law enforcement surveillance increases, as does the need for emergency medical services and fire control and suppression. Some would argue that if access to the National Forest were more restricted, the need for law enforcement and emergency services would also be reduced. Regardless, roads need to be maintained, signed and mapped so that law enforcement and emergency personnel can reach most areas of the Forest

as quickly and as safely as possible. (Issue identified by county commission's survey.)

Issue 7. Dumping of trash along roads and vandalism within recreation areas are areas of concern.

Illegal dumping and vandalism are crimes that are costly to address. With the passage of Subtitle D, many Missouri landfills located south of the Missouri River were closed, which meant access to landfills became limited and the cost of trash disposal increased. This chain of events has resulted in increased illegal dumping all across Missouri, especially along secluded roads like those found in the National Forest. While illegal dumping is occurring along the roadways and in the Forest, vandals continue to plague recreation areas. Most recently, vandals burned a restroom facility on the Houston-Rolla District. More commonly, Forest Service signs are stolen or are used for target practice. Such acts of trash dumping and vandalism can result in the temporary and even permanent closure of recreation areas and roads to the public. (Issue identified by FS managers and county commission's survey.)

Issue 8. Access for the public to National Forest systems lands is a key concern for recreational and other pursuits.

Segments of the public are increasingly concerned that access to public lands is being methodically closed off, many of which have enjoyed access for generations, and believe they have a historical and proprietary right to enjoy and use those lands. Further, an aging and increasingly disabled "boomer" population is requesting motorized access for specific pursuits, such as hunting, and land managers are receiving more and more requests to accommodate disabled persons in off-road activities. Closing roads, for any project, is often the most controversial aspect of a NEPA decision and any notice to close roads is an invitation to significantly increase public involvement in a land management decision. County and local governments, attuned to their local constituents, quickly become interested in National Forest management whenever the discussion moves to road issues.

In addition, there are disturbances occurring in the vicinity of heritage sources, which are related to dispersed recreation. There are also uncataloged heritage sites being exposed and damaged through unauthorized digging, artifact collecting, and vandalism. Access by both Forest system and non-system roads has permitted such illegal activity to occur. (Issue identified by FS managers)

Issue 9. Illegal use of off-highway vehicles (OHVs) on the Forest

OHV enthusiasts, hailing from the cities for weekend recreating, as well as local users, are significantly increasing in number and their use of the Forest. They have the expectation that both Forest system and non-system roads are available

for their use. OHV operators use county and forest system roads to access non-system roads, unauthorized user-made trails or even to travel across county. Motorized traffic, which includes pickup trucks, ATVs, motorcycles, or other types of off-road vehicles are prohibited on non-system roads, unauthorized trails, or from traveling across country. ATV riders within the MTNF also use state highway right-of-ways and utility corridors frequently, which is also prohibited. This illegal OHV activity have resulted in surface erosion, soil compaction, and stream degradation.

Eighteen counties containing MTNF have adopted the ATV permit system, which allows ATV use on county roads within the respective county. Where counties have such a permit system, the Forest Service has then allowed permitted ATVs to be operated on open Forest system roads. There is some concern about the safety of OHV operators on these roads. Mixing both highway and off-highway traffic is questionable, along with the fact that OHV manufacturers clearly state not to use their vehicles on roads. In addition, the roads were never designed to accommodate these smaller, less visible OHVs.

There are two authorized ATV trail systems on the Forest; they are Chadwick Motorcycle and ATV Use Area and Sutton Bluff Motorcycle and ATV Use Area. Chadwick offers 200 miles of trail, while Sutton Bluff has 20, for off-road traveling. Both areas receive a substantial amount of use by OHVs. (Identified by FS managers.)

Issue 10. Update the Forest Plan to reflect the changing needs of road management.

The Forest Plan needs to use the latest Forest Service terminology, classification system, handbooks and manuals to describe its current and desired transportation system. For example, the subcategory of “woods roads” has been difficult to manage. The transportation atlas should be a dynamic system based on the access needed for a variety of natural, social, and economic reasons. Current databases and management tools, such as INFRA and GIS should be used store, manage, and update data about the road system.

Density limits need to be reevaluated and substantiated. Current methods of determining road density are questionable. Actual density limits should be based on current environmental, social, and economic factors.

Monitoring and evaluation of road closure methods needs to be conducted. Determine which method(s) is most successful and cost effective. Prioritize the order in which non-system roads should be closed (Issue identified by FS managers).

Issue 11. Determine the long-range plan of developed recreation areas.

The long-range plan of individual recreation areas needs to be determined, as this can affect the access needs of the area. It is likely that some recreation areas may need road improvements, while other just regular maintenance, and yet for some an elimination of roads due to social, economic, or environmental reasons. In addition, the continued vandalism of a recreation area can force Forest managers to permanently close an area. The ability of the Forest to manage a number of recreation areas across the Forest should be considered as well (Issue identified by FS managers).

Chapter 4: Assessing benefits, problems and risks

Purpose and Products

The purpose of this step is to:

- Assess the various benefits, problems, and risks of the current maintenance level 3 and 4 road system and whether the objectives of Forest Service policy reform and Forest Plans are being met.

The products of this step are:

- A synthesis of the benefits, problems, and risks of the current road system,
- An assessment of the risks and benefits of entering any unroaded areas, and
- An assessment of the ability of the road system to meet objectives.

Current Road System Benefits, Problems, and Risks

The IDT systematically examined the major uses and effects of the maintenance level 3 and 4 road system to generate the information baseline against which the existing and future road system was compared. The main element of this step is to assess the various benefits, problems and risks of the current road system and whether the objectives of Forest Service policy reform and Forest Plans are being met.

Following are key questions that were used in this road analysis to assess the benefits, problems and risks. Benefits are the potential uses and socioeconomic gains provided by roads and related to access. Problems are conditions for certain environmental, social and economic attributes that land managers feel to be unacceptable. Risks are likely future losses in environmental, social, and economic attributes if the road system remains unchanged.

Ecosystem Functions and Processes (EF)

EF 1) What ecological attributes, particularly those unique to the region, would be affected by roading of currently unroaded areas?

Unroaded areas may differ from roaded areas in many ways related to ecological integrity. The presence of roads can be associated with distribution and spread of exotic plants, changes in forest composition and structure including the loss of old-growth forest characteristics, changes in fuel loading, and increased probability of human-caused ignitions (Hahn and others). There can also be both direct and indirect effects upon aquatic and terrestrial species and habitats, and effects on management activities including fire suppression and law enforcement. Road density, road class, road location and types of habitats traversed by roads may influence the severity of those effects. The

presence of roads in previously unroaded areas will likely accelerate access for a variety of forest management activities, including timber harvest, that will change the amount, pattern and composition of forest cover, and that may lead to changes in ecological processes.

See also discussion of unroaded areas in the following Ecosystem Function questions.

EF 2) To what degree do the presence, type, and location of roads increase the introduction and spread of exotic plant and animal species, insects, diseases, and parasites? What are the potential effects of such introductions to plant and animal species and ecosystem function in the area?

Roads influence the spread of exotic organisms through the direct effects of vehicles transporting organisms and through the indirect effects of habitat alteration and ground disturbances that favor weedy species. The organisms may in turn have undesirable effects on native species and ecosystems. Unpaved county and forest roads that have surfaces of aggregate or native material offer more seedbed opportunities for invasive exotic plants than paved highways.

In Missouri, invasive exotics such as kudzu, musk thistle, Johnson grass, spotted knapweed and *Sericea lespedeza* are particularly associated with disturbed areas along roads and other rights-of-way (ROW). Kudzu was used to help stabilize some ROW segments along federal and state highways in Missouri. *Sericea lespedeza* has been planted along most state, county and Mark Twain National Forest roads for stabilization and erosion control. Now recognized as damaging invasives, the Missouri Department of Transportation and the Mark Twain National Forest are no longer using kudzu and *Sericea lespedeza* for ROW stabilization. The Forest Plan encourages the use of annual seed mixtures to stabilize disturbed areas, until native or naturalized vegetation is established.

Kudzu is known to exist along roads in southeast Missouri. *Sericea lespedeza* is prevalent along ROWs throughout Missouri. *Sericea lespedeza* could be spread along roads from seeds carried on grills and under-carriages of vehicles. It can choke out native vegetation and form dense stands along highways. It is difficult to control, since its seeds are viable for 20 years. In Missouri, this plant spreads quickly and is detrimental in prairies, glades, savannas and range land, where it is not as palatable to livestock or wildlife as native vegetation.

Other exotic plants could also be potentially damaging to native species and ecosystem functions, but do not presently seem to be associated as strongly with road systems, or do not appear to have the high damage potential of *Sericea lespedeza*.

Relatively little new road construction is proposed in the future. Road management consists primarily of reconstruction or maintenance of existing roads (asphalt overlay, blading, pulling ditches, removal of encroaching or dangerous vegetation). These project-

related road reconstruction and maintenance proposals are anticipated to have negligible effects on the introduction or spread of invasive exotic organisms.

EF 3) To what degree does the presence, type, and location of roads contribute to the control of insects, diseases and parasites?

Roads provide a transportation network that is important in managing pathogens, including plant diseases and pest insects. For example, roads are important in controlling very damaging outbreaks of southern pine beetle in the south. They allow felling and removal of infested material before adults emerge to breed and infest new trees.

Throughout the Forest, roads, particularly county and forest roads, will facilitate management activities to fell, burn or remove insect infected or diseased trees. These activities could help stem spread and control of insects, disease and parasites. State highways will often be vital to get infested logs to mills where sawing them into products will simultaneously eliminate additional damage and prevent borers from completing their life cycles and successfully breeding to re-infest trees previously attacked and damaged, or to infest still more trees.

Conversely, roads can also provide a network for introduction and dispersal of pathogens and insects. For example, the gypsy moth (*Lymantria dispar*) a potentially devastating defoliating insect has been transferred into Missouri, as it has been found on passenger and truck vehicles from other parts of the country. Gypsy moths, because of their preference for oaks, and their history of completely defoliating and killing large numbers of oaks in infested areas of the eastern United States, are considered the most dangerous exotic threat to Missouri's oak forests. During the past 10 years, there have been several gypsy moth introductions in and near the Mark Twain National Forest. These include an introduction of egg masses on household goods near Boss in Dent County (within the boundaries of the Salem Ranger District), an introduction on a fire truck from New England at Evening Shade in Texas County (within the boundaries of the Houston Unit of the Houston/Rolla/Cedar Creek Ranger District), and several introductions in Stone and Taney Counties (within or near the boundaries of the Cassville Unit of the Ava/Cassville/Willow Springs Ranger District).

Roads of all categories have been vital locations in the placement of gypsy moth traps to survey for the presence of male moths throughout the state. Where male moths are caught in the pheromone attractant-baited traps, numerous traps are set on extensive grid patterns around each of the catch locations for two years, in order to capture and eliminate any additional male moths. Such mass trapping, greatly facilitated by state, county and Forest roads, has thus far enabled many cooperating federal and Missouri State agencies to prevent gypsy moths from becoming established in the state.

EF 4) How does the road system affect the ecological disturbance regimes in the area?

The primary disturbance regime is wildland fire. Wildfire in the Ozarks can be characterized by two factors: frequency and intensity. Where frequency is high, fires are seldom highly destructive, whereas infrequent burns can tend to be catastrophic. All the road classes within the Forest, to varying degrees, influence this regime by producing breaks in the forest canopy that serve as fuel breaks. These, in turn, affect the plant communities and their adaptation to fire. Low intensity fires and/or under burning fires would likely be most influenced by the road system as these would serve as effective fire lines. With the drought conditions and exclusion of fire from forested areas, wildland fires would likely be high intensity and spread by spot fires. Roads would not serve as effective fire breaks in these conditions but would provide access for fire crews and equipment.

Wind is a common disturbance in the analysis areas. The Missouri Ozarks experience frequent thunderstorms with high winds. Trees left standing adjacent to roads may be subject to wind throw especially in areas where oaks have also been subjected to insect damage.

Extreme precipitation events can result in floods, and can have a marked effect on natural resources (Mark Twain Watershed Assessment Report, Forest-wide Assessment, September 2001). During these conditions, the road system (especially within 300 feet of a stream) can act as channel extensions and can deposit or carry large amounts of sediment into the stream.

All watersheds within the Forest have roads surfaced with aggregate material or roads of unknown condition that could have the potential for contributing sediment to a stream. Extreme precipitation events increase the probability for this occurrence.

EF 5) What are the adverse effects of noise caused by developing, using and maintaining roads?

Noise associated with construction and maintenance of roads may affect wildlife. Adverse effects on wildlife vary with the intensity and duration of the disturbance and can range from short-term behavioral avoidance of the area during maintenance activities, to long-term impacts such as shifts in home range and altered reproductive success. Long-term impacts are more likely to be associated with new road construction into relatively unroaded areas or along state or interstate highways with heavy traffic.

Noise produced by road improvements work, maintenance activities or increases in traffic volume may have a greater adverse effect on wildlife, if the road is normally gated or closed. However, many wildlife species have or are able to adapt and tolerate noise along open Forest roads and major highways. The effects of noise associated with road construction, improvement, and maintenance varies by frequency of the work. Effects are also expected to vary across the Forest due to volume of traffic.

Road construction during the breeding season can disturb some avian species. Nest abandonment during incubation or when young are in the nest, may occur when construction activities (and associated noise) are near the nest. Noise associated with road construction, maintenance and use may modify an animal's behavior causing altered movement patterns. Adverse effects on wildlife varies with the intensity and duration of the disturbance and can range from short term avoidance of the area during construction and maintenance activities, to long-term impacts such as shifts in home range and altered reproductive success.

Noise can also impact recreationists in an area. The Forest has several primary state highways passing through it. The road system is extensive and has heavy equipment use that can be very loud and frequent. Recreationists seeking solitude (or a less active area) would avoid areas due to the construction and maintenance work associated with the road system or heavily traveled roads such as federal and state highways.

The greatest increase in road related noise within the Forest would occur during road construction or reconstruction. With implementation of standards and guidelines related to road construction or reconstruction and use, and considering how long these roads have been in place, there are no anticipated significant noise related effects to people or wildlife from the existing Forest Road System. Noise related effects are more likely to occur from new construction and use of non-system roads within the Forest.

Aquatic, Riparian Zone, and Water Quality (AQ)

AQ 1) How and where does the road system modify the surface and subsurface hydrology of the area?

The road system modifies the surface and subsurface hydrology of the area by intercepting ground and surface water and routing it more quickly to stream channels through the ditch system. Many of the roads in the Mark Twain National Forest, particularly non-federal public and private roads have been in place for a long time, in some cases, over 100 years. Except for state highways, most of these roads are gravel, coarse rock or dirt surfaced (native surface) and have been graded and re-graded for decades, with little or no intent of maintaining the road crown, ditches or cross-drainage.

As a result of lack of maintenance many roads on the Forest are becoming entrenched, sometimes to depths of several feet. Entrenched roads of this type are located on ridge-tops, hill slopes and valley bottom landscape positions throughout the Mark Twain National Forest. Valley bottoms, which often contain coarse alluvium, serve as recharge areas for the surface and ground water systems. Ridge-top and mid-slope roads can reduce or alter overland flow processes by intercepting the water into the ditch system and routing it quickly to surface waters, or by compacting areas, which previously had been permeable. In addition, a number of existing unclassified roads and trails, that intercept and channel surface water flows, are not on Forest maps

AQ 2) How and where does the road system generate surface erosion?

Surface erosion occurs because road surfaces, cut-slopes, fill-slopes and associated drainage structures are usually composed of erosive material that is exposed to rainfall and concentrated surface runoff.

The road system has the greatest potential to generate surface erosion in the entrenched road segments described in AQ1. These roads typically follow the topography, forming ad-hoc channels or ditches along ridge-tops, valley side-slopes and stream bottoms. Sediment is released at their outlets where water is released onto the hillside, valley bottom or stream crossing. Erosion is also being generated by networks of user-defined ORV trails that are concentrated in certain parts of the analysis area, within various watersheds. ORV and ATV traffic on utility right-of-ways in the analysis area is also generating significant amounts of surface erosion.

The road and highway system in the project areas can contribute sediment and pollutants through surface erosion. These road surfaces prevent infiltration of precipitation, causing an increase in runoff. Road stream crossings can also generate surface erosion. Each watershed in the analysis area contains numerous stream crossings, many of which are aggregate and dirt surfaced. Roads within 300 feet of streams add several miles of channel extension to the watershed. Additional miles of “other” roads of unknown condition are located in most of the watersheds. Each of the above has the potential of increased surface erosion and sediment to the stream.

Non-systems roads and other unclassified roads have been used as networks for illegal ORV and ATV use. This can result and has resulted in significant amounts of erosion in the past and will likely continue in the future. The primary opportunity for reducing this impact appears to be partnerships with ORV/ATV groups in rehabilitating and restoring these areas. Other options may be to designate trails for motorized use, or develop motorized use areas.

Constructed dips on system roads and water bars on skid roads are often the outlets where water on the roads is directed onto the hillside. There is a great diversity in the quality of dips and water bars throughout the Forest. Some water bars are quite effective at reducing surface erosion. Others appear to create more soil disturbance than they prevent because they resemble check dams due to inadequate construction.

Traffic on utility right-of-ways can create significant amounts of surface erosion. The primary cause of this in the analysis area is unauthorized ORV and ATV use on power-line and pipeline right-of-ways. Examples of this type of erosion are evident in several areas.

It is impossible to be too specific as to the exact amount of surface erosion, which the road system generates due to the density of classified roads as well as unclassified non-system roads and private roads within the Forest. Runoff and sediment production was

modeled for representative forest road types within the analysis area. A comparison was made between aggregate surfaced Forest roads and roads with paved surfaces. The analysis simulates the effects of ten years of weather and use upon Forest roads in various areas of the Mark Twain National Forest. This analysis utilizes the Water Erosion Prediction Process (WEPP) Forest Road Erosion Predictor model. Results of the analysis are displayed in Appendix 3.

The inputs of the modeling indicate the factors associated the erosion of roads and sediment levels. Climate is one such factor. The model was run for six different locations encompassing many areas in the Forest Boundary. Data from climate stations near these locations were incorporated in the model and thus erosion and sediment levels were different in each area. The following table outlines the climate stations used and the unit areas they apply to.

Climate Stations Used in WEPP model	Road Unit areas
Arcadia	Potosi and Fredricktown
Doniphan	Doniphan, Eleven Point, and Poplar Bluff
Jefferson City Radio KWS	Cedar Creek
Rolla School of Mines	Rolla and Houston
Salem	Salem
Springfield	Ava, Willow Springs, Cassville

Other factors include road type, surface type and road design. Three different road types were modeled (low gradient, ridge top road; low gradient, side slope road; and high gradient, side slope road) and erosion and sediment levels were different for each type. Two different surface types were modeled, aggregate and asphalt, to take into account the maintenance level 3 and 4 roads identified in this analysis. These two types of road surfaces also affected the erosion and sediment levels. Four different road designs were included in the model. These were insloped with a bare ditch, insloped with a vegetated or rock ditch, outsloped with a rutted road surface, and outsloped with an unrutted road surface.

The model had two outputs. These were surface erosion within the road prism (in pounds per year) and sediment leaving the road buffer (in pounds per year). Overall, the combined amount of surface erosion and sediment leaving a road buffer was lowest on outsloped roads with an unrutted road surface. This result remained the same for every location, road surface (aggregate or asphalt), and road type (low gradient ridge top roads or low and high gradient ridge top roads). There were some insloped aggregate roads modeled with vegetated or rock ditches which had road prism surface erosion totals which were similar to outsloped unrutted aggregate roads, but the amount of sediment leaving the road buffer was higher. The sediment leaving the road buffer, as determined from the model, is important due to the possibility of this sediment ending up in adjacent streams. The take home lesson is outsloped, unrutted roads generally contribute less erosion and sediment than other road designs and should be considered in road maintenance planning.

Surface erosion from the road prism had a high variability depending on various factors mentioned above. The interpretation of these values in relationship to the Forest Plan is open to interpretation. There are T-values for various soil types. These are the maximum amount of soil loss (in tons per acre per year) for which a site can tolerate and continue to permit a high level of productivity (forests, crops, grasslands, etc) that could be sustained indefinitely. Depending on the soil type, these values could range from one to five tons per acre per year. These T-values are included in the Forest Plan. It states that “no vegetative manipulation or utilization practices shall cause average annual soil loss to exceed Soil Conservation Service (now the Natural Resources Conservation Service)_T-values.” It is not clear if this includes road construction, maintenance, or use. If this is included under the provision, the outsloped, unrutted roads appear to offer the highest probability of keeping soil loss within the tolerance values. Otherwise, soil and sediment loss can still be minimized and be in compliance with the current Forest Plan.

AQ 3 – How and where does the road system affect mass wasting?

Landslide and mass wasting activity are very rare in the Ozark area in southern Missouri and on the Mark Twain National Forest overall. Hillslope gradients are relatively gentle compared to forest ecosystems in the western United States where landslides are more widespread and frequent. The bedrock geology, geologic structure, and soil types are far different from conditions in other parts of the country where mass wasting is more prevalent. The slope position of roads will generally influence the levels of erosion and sediment but these levels are not usually the result of landslides. Inadequate road construction and road drainage may be the reasons for mass wasting to happen and the locations where these factors appear are generally on older roads constructed before stricter specifications for road construction came into being. Roads constructed on soils with perched water tables will generally experience increased erosion. However, most of these soils occur on ridge tops and result in ponded water and not mass wasting events.

Mass wasting or landslides are a part of the natural disturbance regime in some terrestrial and aquatic ecosystems. The type, frequency, magnitude and distribution of landslides (if they occur) differ significantly in different geologic settings. One valuable piece of information is the past, present and potential future sites of landslide activity.

AQ 4) How and where do road-stream crossings influence local stream channels and water quality?

There are a number of low-water crossings, the vast majority being on non-Forest roads and mainly on ephemeral, intermittent and interrupted stream channels within the Forest. These are sites where sediment generated by road surface and roadside erosion and other road related pollution could directly enter the aquatic systems. Roads within 300 feet of streams add several miles of channel extension to the watershed.

AQ 5) How and where does the road system create potential for pollutants, such as chemical spills, oils, de-icing salts or herbicides to enter surface waters?

Road crossings provide the greatest potential for pollutants to enter stream systems. Valley bottom roads also represent a potential route for contaminants to enter surface waters. Chemical herbicides are used to treat roadside noxious weeds and control encroachment by brush and herbaceous vegetation on non-Federal public roads and may present a risk for surface and ground water pollution. The use of herbicides on utility right-of-ways is another potential source of pollution. De-icing salts are not used frequently on roads in Missouri and do not present as large a potential pollution source as they do in more northern latitudes. The greatest potential for large-scale pollution would occur in the event of a break in natural gas and ammonia pipelines where they cross stream channels.

AQ 6) How and where is the road system ‘hydrologically connected’ to the stream system? How do the connections affect water quality and quantity (such as delivery of sediments, thermal increases, elevated peak flows)?

The road system is directly connected to the stream system at low-water crossings, where the streambed serves as the roadbed. Midslope and valley bottom roads drain surface runoff and groundwater more efficiently, which increases peak flows. The lower a road is in the watershed, the greater the impact.

AQ 7) What downstream beneficial uses of water exist in the area? What changes in uses and demand are expected over time? How are they affected or put at risk by road-derived pollutants?

Designated beneficial uses within the watersheds include: fish and aquatic life, recreation, water supply and agriculture. Fish and aquatic life are the water uses that are most affected by road-derived pollutants. Sediment can decrease habitat quality and spawning success for fish species and alter habitat for aquatic invertebrates. Chemical and other road-derived pollutants can kill or stress fish species and other aquatic life.

AQ 8) How and where does the road system affect wetlands?

Large areas of wetlands are not a common feature of the karst terrain, which is prominent on the Forest. Valley bottom roads cross wetlands in a few locations, typically at or near stream crossings. This is where the most direct impact of the road system occurs on wetlands. Very small and localized areas of wetlands occur as side-hill seeps in the vicinity of springs throughout the valleys of the Mark Twain National Forest. Most of these wetlands are relatively small (less than one acre) in size and are not mapped. Side-slope roads often intercept these seeps and re-route their flows into roadside ditches or under the road by culvert or small bridge. The Forest Plan, p. IV-52 as specialized habitat and p. IV-47 protects the larger known wetlands, fens and seeps.

AQ 9) How does the road system alter physical channel dynamics, including isolation of floodplains; constraints on channel migration; and the movement of large wood, fine organic matter and sediment?

Valley bottom roads have a potential to impact streams by constraining the stream channel, eliminating or reducing floodplain access by the stream, and altering the movement of sediment and organic matter, including large wood. Road crossings can divert stream channels, block flows, alter channel morphology, and reduce bed and bank stability. Improperly designed and located bridge abutments can constrain stream flows and increase velocities, drastically altering channel morphology, while undermining stream bank and bed stability.

AQ 10) How and where does the road system restrict the migration and movement of aquatic organisms? What aquatic species are affected and to what extent?

The existing road system presents a variety of potential obstacles to aquatic migration and movement. The following drainage structures are listed in order from the least to most negative impact on aquatic species (Warren & Pardew, 1998):

1. Bridges may provide a natural passageway for the migration and movement of aquatic organisms where stream bank modifications do not increase water flow nor soil erosion. Generally, a straightened channel under a bridge increases stream gradient and velocity and reduces diversity of current patterns. This will in turn cause erosion upstream and sediment deposition downstream. (Bryan & Rutherford, 1995). Forest Plan mitigation measures include minimizing alteration to original stream channels and proper seeding or planting of vegetation to insure stream bank stability and decrease erosion and sedimentation. Also, planting aquatic vegetation will promote biological productivity and diversify food webs. (Waters, 1995).

2. Ford crossings where the streambed serves as the road. Ford crossings provide a natural passageway for the migration and movement of aquatic organisms. However, high use of ford crossings increases turbidity in sufficient amounts that negatively impacts aquatic life (Zurbrick, 1996). Forest Plan mitigation measures include enforcement of motorized traffic to cross streams at designated perpendicular crossings and to prohibit motorized traffic in the stream outside of the designated crossing. Ford crossings would not be allowed where use is re-occurring and frequent (Zurbrick, 1996; Waters, 1995).

3. Multiple channel box concrete culverts are preferred over single channel box concrete culverts. A single channel culvert provides little or no habitat for aquatic organisms. Forest Plan mitigation measures include using a multiple channel box culvert where one box is lower than the other boxes to provide a narrow single channel during periods of low stream flow, which will help prevent sediment buildup (Waters, 1995).

4. A culvert designed without regard for stream organisms may pose barriers to the upstream movement and dispersal of invertebrates and small-stream

fishes by 1) breaking the continuity of water flow in a stream, 2) increasing the stream's velocity to a higher than natural rate if the culvert's bottom has no gravel, rocks, or cobbles, then there would be a break in the stream's substrate (Warren & Pardew, 1998). Forest Plan mitigation measures include: 1) construct bridges or make the culvert as wide as possible to allow for lateral movement of the stream, and 2) the bottom of culverts should be set at least eight inches below the surface of a stream's substrate (Waters, 1995; Bryan & Rutherford, 1995).

5. A solid concrete slab with no culverts may act as a stream dam if there is a vertical drop off, serving as a total biotic aquatic barrier for much of the year (Warren and Pardew, 1998). Forest Plan mitigations measures include limiting the placement of solid concrete slabs with no culverts to low velocity streams in locations where vertical water drop offs will not occur (Warren and Pardew, 1998).

6. Road ditches intercept, collect, and re-route water and sediments, which may end up in streams. Sedimentation alters the natural relationship between the biota and the stream substrate by changing the condition of the substrate. Increased sedimentation can adversely affect the biota by reducing or covering their food supply and interfering with feeding and respiration (Waters, 1995). All types of aquatic species may be adversely affected by sedimentation. As sediment increases, the macro invertebrate taxa changes. The two most important effects of deposited sediment upon the physical habitat of fish are the filling of space between rocks which is essential to fry as winter cover and reduction of water depth in pools, which decreases physical carrying capacity during summer (Waters, 1995). Forest Plan mitigation measures include re-routing of water from roads to frequently placed outlet ditches in order to retain sediment near its site of origin and away from streams (Waters, 1995).

AQ 11) How does the road system affect shading, litter fall and riparian plant communities?

Streams with roads parallel to them can have little or no stream canopy or shading. The increased sunlight can elevate water temperature, which may alter dissolved oxygen levels and primary production in the stream (Bryan & Rutherford, 1995). Forest Plan mitigation measures include relocating or closing roads that parallel perennial streams.

Areas lacking deciduous vegetation (litter fall) have low diversity, low numbers of aquatic invertebrates and the loss of an energy source (Kohler & Hubert, 1993). In the oak-hickory hardwoods forest and woodlands of the Ozark Plateau, litter fall is not a limiting factor in aquatic systems. The deciduous tree and shrub vegetation produces abundant organic material, which high stream flow distributes throughout the aquatic system.

Riparian habitat that has been converted to a road system is land conversion and results in a loss of riparian plants and entire riparian plant communities. The existing road system reduces the amount of large woody debris entering stream channels because it is removed as part of bridge and water crossing maintenance. Large woody debris greater than 12 inches in diameter is required in streams to provide habitat diversity and complexity, channel stability and to aid in formation of pools (Waters, 1995). The Forest Plan provides for tree species in riparian stands to assure that diameter and height of over-mature trees is attained. Forest Plan mitigation measures include 1) not placing roads parallel to a stream, and 2) designing stream crossings that permit large woody debris to pass through the stream system.

AQ 12) How and where does the road system contribute to fishing, poaching or direct habitat loss for at-risk aquatic species?

Following the enactment of the Missouri Conservation Sales Tax in 1977, the Missouri Department of Conservation (MDC) pursued acquisition and development of access roads and parking lots at streams which might otherwise be “private” or available to only a relatively few individuals (McPherson, 1994). In addition to MDC accesses, there exist Corps of Engineers, National Park Service, Missouri Department of Natural Resources, and local community stream and lake accesses within National Forest proclamation boundaries. These accesses ensure most streams and public lakes are available for fishing and other forms of recreation. The positive effects of this road system are dispersal of public use over many stream miles which minimize crowding; access for other forms of recreation associated with streams and lakes; a reduction in the number of private river access areas; no cost to use access sites, and future availability of lake and stream access in Missouri (McPherson, 1994).

The existing road system is extensive; however, poaching is kept at a low level due to the large number of rural residents with telephone communication, the increasing number of drivers with mobile communication, the implementation of Operation Game Thief/Forest Arson (call 1-800-392-1111) and increased law enforcement patrols. Forest Plan mitigation measure includes constructing dead end roads to deter poaching.

The streams in the Ozark region have been severely damaged by early land use practices that created erosion problems resulting in excessive gravel bed loads (Jacobson & Primm, 1994). This has adversely affected water quality, stream basin stability and in-stream habitat for at-risk aquatic species. The aquatic species at-risk are identified by the FWS and Federally listed, the Regional Forester as sensitive (Regional Forester’s Sensitive Species list) and those given the status as Endangered in the Wildlife Code of Missouri called Missouri Species of Concern. Forest Plan mitigation measures would be not to place roads parallel to streams. In addition, minimizing road mileage and proper road placement are important factors in eliminating direct habitat loss for at-risk species (Waters, 1995). A study on the Chattanooga River watershed in South Carolina identified 1,100 sediment sources, of which 80 percent were from open, unpaved roads. A southern Appalachia study showed that improving roads and culverts reduced suspended sediment by 60 percent. Therefore, road improvement and maintenance are

necessary for reducing erosion and sedimentation from the existing road system (Waters, 1995).

AQ 13) How and where does the road system facilitate the introduction of non-native aquatic species?

Within their natural range, most aquatic plants and animals are kept in check by the powerful forces of competition, predation and disease. If moved to new regions, however, these aquatic species may be freed from their normal biological and physical constraints and spread unfettered. They displace native aquatic plants and animals, disrupt ecological processes, upset the stability of ecosystems and can permanently change our natural landscapes. Of 40 North American freshwater fishes that have become extinct over the past century, the American Fisheries Society has documented that introduced species were a contributing factor in 68 percent of these extinctions (NatureServe Explorer: An online encyclopedia of life (web application), 2002, Version 1.6, Arlington, VA, USA).

A recent invertebrate invader, the zebra mussel, is overwhelming aquatic systems along the Mississippi River and will most likely invade inland lakes and streams in Missouri by attaching themselves to boats, which are transported over the existing road system to new waters. The zebra mussel out-competes native mussels in feeding, growth, movement, respiration and reproduction. Native mollusk populations tend to disappear within four years of zebra mussel colonization.

It is important to remember that non-native exotic aquatic species not only include those species outside of North America but also species native to North America that have been introduced to drainages outside their native ranges within the USA. In addition to the term “exotic,” non-native species have been referred to as alien, foreign, introduced or nonindigenous species. To date, the state of Missouri does not have a statewide invasive species council or plan for addressing invasive species in the state.

The existing road system and increased human population has accelerated the invasion rate of non-native aquatic species into Missouri waterways, either intentionally or by accident. Forest Plan mitigation measure is to define and document which species are invasive; then 1) prevent the arrival of new invasive pests, 2) early detection and eradication, and 3) if the invader is established, containing their spread and numbers will help minimize their effects on natural systems.

AQ 14) To what extent does the road system overlap with areas of exceptionally high aquatic diversity or productivity or areas containing rare or unique aquatic species or species of interest?

Within the Forest proclamation boundary, the road system overlaps with areas of exceptionally high aquatic diversity and areas containing sensitive aquatic species (Heritage Data Base dated July 7, 2000, version 2). The distribution of 67 fish species, or nearly one-third of all Missouri fishes, is centered in the Ozarks (Pflieger, 1997). Twenty of these are unique to the Ozark Region, occurring nowhere else in the world. The

distribution of 25 crayfish species, or nearly four-fifths of all Missouri crayfish, is centered in the Ozarks (Pflieger, 1996). Sixteen of these species are not known to occur outside the boundaries of the Ozark region. Seven of these 16 are not known to occur outside Missouri. The Ozark Plateau harbors one of the richest assemblages of freshwater crayfish and fish fauna on the North American continent (Pflieger 1996, 1997). The rainbow trout was first introduced into Missouri in 1882 and is a desired non-native species of considerable economic importance. Small, self-sustaining populations have been established and are managed as “wild trout management areas.” Four such areas are associated with the Mark Twain National Forest. Trout are highly valued by many fishermen and the demand for trout fishing has resulted in the establishment of “put and take” trout fishery in suitable waters of the Ozark region (Pflieger, 1997). All of the watersheds within the MTNF have documented exceptionally high aquatic diversity (Heritage Data Base dated July 7, 2000, version 2); however, there is no designated critical habitat on the MTNF for any listed species (Federally listed from FWS dated July 31, 2001, Regional Forester’s Sensitive Species listed dated February 29, 2000, or Missouri Species of Concern listed March 1, 2002). Proper road placement is the single most important factor in reducing overlap with areas of high aquatic diversity and unique, sensitive species (Waters, 1995). Relocation of the sensitive species may also be an option.

TERRESTRIAL WILDLIFE (TW)

TW 1) What are the direct effects of the road system on terrestrial species habitat?

Roads may directly affect terrestrial species habitat in a number of ways. These include altering the physical conditions of habitat, increasing contamination of pollutants (sediment, salt, etc.), increasing habitat loss, fragmentation and edge effects and facilitating the spread of exotic species. The most significant effects on habitat will be on and along paved and heavily trafficked roads.

Interstate 44 intersects some sections of the Mark Twain National Forest and certainly has a significant impact due to heavy traffic volumes and the size of the highway. Other highways maintained by Missouri Department of Transportation (MoDOT) that bisect the Forest include highways 8, 13, 14, 17, 19, 32, 39, 49, 54, 60, 63, 67, 72, 76, 86, 95, 112, 125, 160, 172, 181 and 248. These state highways vary greatly in the volume of traffic and impact that they have on the Forest.

In all cases, they have altered the habitat and contributed to chemical pollutants from vehicle emissions and products used to maintain the road and to clear ice and snow. These contaminants can become concentrated in the soil and vegetation adjacent to the highway and can have detrimental effects on vegetation and/or wildlife. However, the effect appears to be limited to the right of way areas immediately adjacent to the highways and does not encroach on the Forest in any significant way. Possible exceptions include road construction/maintenance activities that impact streams and waterways through erosion and sedimentation. These activities are under the jurisdiction of the

Missouri Department of Natural Resources and are closely regulated under the Clean Water Act.

In regards to exotic species, the road system can facilitate the introduction of invasive species through both direct and indirect methods. The road system can introduce invasive species directly by transportation of that species into the Forest. Invasive and/or exotic species can also be introduced indirectly through the alteration of habitat and ground disturbances that allow weedy species to get a foothold in a particular area.

In almost all cases, exotic species are introduced through human activities—either intentionally or by accident. Examples of intentional introductions are planned plantings of exotics like kudzu and *Sericea lespedeza* that were done along some roads for erosion control and stabilization. These two species are now considered to be damaging invasives. In Missouri, kudzu is currently limited to the southeast part of the state. *Sericea lespedeza* is prevalent throughout the state and can be spread by carrying seeds on vehicles. This species can choke out native plants and form dense stands along roadways. It can quickly take over prairies, glades, savannas and rangeland. It is very difficult to control because its seeds are viable for 20 years. For these reasons, *Sericea lespedeza* is considered to be one of the most damaging threats to the MTNF.

Unintentional introductions can include gypsy moths hitching rides on automobiles or camping trailers from infected areas into previously unaffected forests. Fungi or insects can be transported in host wood used for shipping material—crates or pallets. The introduction of exotic species can have severe impacts on forest ecosystems, including population declines or even extinctions of native species, shifts in predator-prey dynamics, shifts in species niches and changes in habitat. All of these result in reducing biological diversity of ecosystems. (USDA Fact sheet on Invasive Species, 1999).

Examples of species of concern include the gypsy moth, Asian longhorn beetle, nun moth, garlic mustard, Japanese knotweed, purple loosestrife, spotted knapweed and Sudden Oak Death. There have been outbreaks of gypsy moth infestations in Missouri, which have been successfully eradicated. But this species will continue to be a threat to the area. Knapweeds and purple loosestrife have been present for several decades in Missouri and eradication efforts have, so far, controlled these nonnative species. However, they will continue to present problems.

Although the road system contributes to the spread of exotic species, its existence is also vital in providing access to manage these invaders.

TW 2) How does the road system facilitate human activities that affect habitat?

The primary activities facilitated by the existing road system include minerals development and maintenance; recreational activities in the form of hunting and off-highway vehicle (OHV) use; and vegetation manipulation. Effects on wildlife habitat that can occur as a result of these activities include: changes in wildlife habitat conditions resulting from vegetation manipulation and mineral developments; loss of standing and

downed woody debris due to firewood collection; increased sedimentation due to road use and maintenance; sedimentation and damage to vegetation resulting from OHV use; and, point source pollution from trash dumping.

Roads may also facilitate human activities that result in habitat disturbances. Disturbances may include removing structures (snags and logs), losing habitat to fires from human ignitions and destroying habitat by trampling and illegal dumping.

Illegal dumping continues to be a chronic problem in the MTNF. Garbage, discarded tires and old appliances are a common sight along MTNF roads. This issue is not just a problem on the MTNF, but throughout rural areas of the state. Unfortunately, the roads that serve to provide access for all of the legal activities occurring in the Forest also provide excellent opportunities for those people interested in illegally disposing of solid waste. Toxic wastes from transient methamphetamine (meth) labs are also an effect from illegal drug activity and the dumping of waste associated with meth production.

Garbage, old tires, waste oil and old appliances all negatively impact habitat. Toxic materials such as waste oil, antifreeze and household hazardous wastes can result in mortality of animals and the plant species they depend upon. These materials can also contaminate water sources—even leaching into groundwater resources in areas with karst topography. Old tires provide prime habitat for disease-carrying mosquitoes to breed. Some appliances contain freon and PCBs that damage air, soil and water resources. Appliances and plastic garbage can also trap or injure wildlife. The prevalence of these dumpsites affects both habitat and aesthetics of the Forest.

Due to the number of acres affected, timber harvest has the greatest potential to alter wildlife habitat conditions, both positively and negatively. Since 1986, timber harvest within the Mark Twain Forest has been driven by Forest Plan direction. Objectives and Desired Future Conditions identified in the Plan include providing a mix of habitat conditions designed to meet wildlife needs, as well as guidelines to protect or enhance unique and sensitive wildlife habitat. Additionally, vegetative manipulation is used to meet the Forest Plan, as well as site specific wildlife objectives and timber harvest is often used to provide wildlife habitat conditions that otherwise would be unavailable or scarce. Other activities that promote or improve wildlife habitat and utilize portions of the existing road system include opening maintenance, wildlife habitat improvement work, and wildlife and vegetation monitoring.

TW 3) How does the road system affect legal and illegal human activities (including trapping, hunting, poaching, harassment, road kill or illegal kill levels)? What are the effects on wildlife species?

Roads allow both legal and illegal impacts on species. Legal activities include hunting and trapping. Illegal activities include poaching, harassing, collecting, trash dumping, road kill, disruption of dispersal, displacement and other negative interaction with people. The magnitude of these effects depends on road density, intensity of road use, road

location, types of habitats traversed by roads and the status of populations in the surrounding area.

In addition to effects on wildlife habitat described under TW (1 & 2), many road-related activities also have direct effects on wildlife. Direct mortality from collisions with vehicles is well documented. In general, mortality increases with traffic volume and vehicle speed, and impacts will be greatest from paved roads. However, all species are at risk and some species may be attracted to lower standard roads due to the desirable vegetative cover established in a ROW or will be attracted to the roadbed itself to bask or collect gravel or seeds. Mortality rates on these lower standard roads will be much lower because of the lower volume and speed of traffic on these roads. Amphibians may be especially vulnerable to road kill due to their migration between wetland and upland habitats and because individuals are inconspicuous and slow moving. However, while there is some mortality associated with non-system and open system roads, due to the low level of daily use, road-related mortality is considered minor.

A road system can also facilitate activities such as poaching, trapping and hunting, which result in direct mortality to wildlife. Public access provided by the present road system has not changed significantly within the last two decades, and based on field observations and reports provided by the Missouri Department of Conservation, populations of most game species appear to be stable or increasing. However, MDC and MTNF enforcement agents believe that the illegal taking of game continues to be a major problem in the Forest. As an example, on the first day of the 2002 deer season, three MDC enforcement agents and one MTNF agent made 16 arrests on MTNF lands in Oregon County. Offenses included illegal tree cutting, poaching, illegal ATV use, baiting wildlife and felony methamphetamine possession.

In southern Missouri, the illegal activity of hunting deer with hounds, also known as deer dogging, is a major problem on MTNF lands. The perpetrators of this illegal activity make extensive use of the MTNF road system for this type of hunting, staying mostly in their trucks or on ATVs, and using CB radios to stay in contact with one another. Although the full extent of poaching is unknown, deer dogging has dramatic affects on deer populations even if the animals are not shot during the chase. The stress of this activity upon the deer herd results in lower birth rates and higher incidents of disease. MDC enforcement agents consider this illegal activity their biggest problem in south central Missouri. Due to the road access and relative remoteness of MTNF lands, poachers who use dogs to run deer favor these areas.

TW 4) How does the road system directly affect unique communities or special features in the area?

In addition to direct effects on wildlife species, roads may have both direct and indirect effects on rare communities and special habitat features. Uncommon or unique habitats and the associated wildlife communities that can be found in the MTNF include glades, fens, wetlands, riparian communities and key wildlife winter and breeding habitat.

Special features include rock outcroppings or caves, fishless ponds and temporary pools, springs, seeps, sinkholes and raptor nest sites.

Management prescription 6.3 of the Forest Plan provides temporary management guidelines for a variety of areas that have the potential for “special area” designation other than Wilderness. The selection of these areas for consideration reflects public issues or management concerns for the protection of unusual environmental, recreational, cultural and historical resources, and for areas valuable for scientific or educational studies. Candidate areas for national river status are also included in this category.

Management prescription 8.1 of the Forest Plan describes areas that have received special designation, other than Wilderness. These special areas exist for the protection of unusual environmental, recreational, cultural or historical resources, and for scientific or educational studies. These areas are managed for the purpose of protecting the unique features, animals and plant life that inhabit them. For the most part, motorized use of these areas is prohibited unless it is related to management activities. With the exception of Sinkin Experimental Forest, little or no timber harvest is allowed in these areas. For a list of these areas, please refer to the Forest Plan, pages IV-194, IV-195, IV-199. Areas of the Forest that are under review for designation as Research Natural Areas, Natural History Areas, Cultural Resource Areas and National Rivers are assigned to this category until their classification is decided. These areas are managed to assure that the characteristics that make them unique are not jeopardized by public use or resource outputs.

The direct impact made by the road system is providing access to these sites for management and research activities and for the general public. Negative impacts can include illegal dumping, trampling vegetation and disturbing wildlife. On the positive side, the road system provides access to researchers and viewing opportunities for the general public.

Indirect impacts include the introduction of weeds and other non-native species that may invade the road surface, through road ditches or by vehicular transport. The introduction of these plant, animal and/or insect species may negatively impact these unique plant communities.

Streamside habitat and the adjacent riparian zone add greatly to the wildlife habitat diversity found on the MTNF. Riparian and streamside habitat, as well as the ground vegetation associated with wetlands, are particularly important and provide habitat for a variety of wildlife species. Additionally, although lands with special features or unique communities make up only a small portion of the analysis area, areas with these features or habitats often receive a disproportionate amount of wildlife use and help to meet the specialized habitat needs of many wildlife species. As a result, protection of these areas is important in order to maintain local viability of all wildlife.

The Forest Plan and its amendments recognize the importance of unique wildlife communities and features. As a result, many areas such as wetlands, riparian zones,

floodplains and special features and habitats are given preferential consideration to other resources (Forest Plan IV-51-58).

Economics (EC)

Please note: In order to understand some of the issues that needed to be considered for this analysis, Meramec Regional Planning Commission, in cooperation with MTNF Core Team members, developed a survey for county commissions, and a copy is included in Appendix 5. In October 2002, MRPC staff tested the survey with the Phelps County Commission, in person. MRPC then conducted three more surveys in its service area and then contracted with other regional planning commissions who served the remaining 25 counties. All 29 county commissions were surveyed in October and November of 2002 and a summary of survey question responses with all 29 commissions represented is included in Appendix 6. Two survey entries exist from Crawford County as one commissioner was unable to participate in the survey interview and submitted a completed survey to MRPC for inclusion. Therefore, there are 30 surveys of the 29 county commissions. Many of the responses in this section reflect information gathered from this survey.

EC(1): How does the road system affect the agency's direct costs and revenues? What, if any, changes in the road system will increase net revenue to the agency by reducing cost, increasing revenue, or both.

The number and condition of roads in the Mark Twain National Forest have a financial impact on the Forest Service. If a road goes 10 years without periodic maintenance, costs may increase dramatically. Studies from the University of Missouri show that a lack of timely maintenance may result in repair costs six to ten times higher than they would have been if the roads had been repaired in a timely manner. Additionally, survey and design costs may be incurred to rehabilitate severely deteriorated roads. Also, if roads are in bad repair, income-producing activities will likely slow, and, in some cases, cease.

The following construction, reconstruction and maintenance costs are based on fiscal year 2002 road contracts. The average costs are:

- Limbing trees on a 3-year cycle: \$350/mile/year
- Mowing small vegetation on a 3-year cycle: \$125/mile/year
- Grading maintenance level 3 roads annually: \$225/mile/year
- Replacing aggregate surfacing material (rock): \$150/mile/year

- Construction/Reconstruction: \$20,000/mile for maintenance level 3 roads. More roads are reconstructed than constructed because the primary transportation system is in place. During the last few years, the cost of either constructing or reconstructing a road has risen sharply due to several factors: a declining number of interested bidders for the work, the difficulty in obtaining creek rock for road surfacing due to federal and state regulations and permits, the higher cost of

mined limestone compared to creek rock, and the increased hauling distance from limestone rock quarries to the work sites.

- Asphalt: Overlays of existing asphalt are \$100,000/mile for maintenance level 4 roads.

MTNF districts are collecting about \$9,000 of cooperative maintenance deposits every year, based on the timber sale volume sold and miles of Forest roads used to haul the timber. This money is used to offset the wear and tear of Forest roads by commercial hauling vehicles. The Forest Service needs to evaluate the formula for cooperative deposits.

There are 347 miles of maintenance level 3 roads and 45 miles of maintenance level 4 roads on the MTNF, based on the INFRA Travel Routes database. Surveyed conditions of these roads show a backlog of \$1,433,911 for the maintenance level 3 roads, for an average of \$4,132 per mile, and a backlog of \$1,196,358 for the maintenance level 4 roads, for an average of \$26,586 per mile. Deferred maintenance is maintenance that has not occurred in a timely manner and which has contributed to the decline of a road's condition.

The Mark Twain National Forest Annual Report for FY2002 indicates that program income from minerals, range, land/uses, timber and recreation are sufficient to cover little beyond the direct costs associated with those activities. It is important, therefore, that the MTNF investigate ways to increase revenue to cover the additional costs of road maintenance needed to ensure the continuation of these activities. To increase revenues, the Forest Service could:

1. Ensure that special-use permit holders pay their fair share of road maintenance where appropriate;
2. Improve and modernize recreation areas so that fees could be increased and that more visitors would come and also stay longer;
3. Increase in road maintenance deposits paid by forest products purchasers; and
4. Request increased federal funding to offset inflation.

EC(2): How does the road system affect priced and non-priced consequences included in economic efficiency analysis used to assess net benefits to society?

The Mark Twain National Forest Annual Report for FY2002 shows the following revenues and expenditures for forest activities:

Activity	Revenue	Expenses
Timber	\$3.3 million	\$2.6 million
Minerals	\$2.4 million	\$290,000
Range	\$9,000	\$230,000
Land/uses	\$52,000	\$1.2 million
Recreation	\$7,000*	\$1.1 million

**Does not include recreational special use permits or fee demonstration projects, which resulted in approximately \$200,000 in FY2002.*

As indicated by the figures above, the priced consequences of some forest activities, such as timber harvest and mineral production, are positive. Other activities carry negative priced affects, such as range and other land uses and recreation. Non-priced consequences are much more difficult to identify, but generally, the more positive consequences can be seen in the recreation activities that provide valuable experiences to those who participate. Those activities that produce the most valuable priced consequences seem to produce the least valued non-priced consequences.

According to the Teddy Roosevelt Conservation Alliance report on “The Economic Impacts of Fishing, Hunting, and Wildlife Viewing on National Forest Lands” the economic output of each activity for Missouri in 1996 is as follows: freshwater fishing \$80,529,693; wildlife viewing \$166,257,325; and hunting \$119,753,851. These numbers represent about 4,200 fulltime jobs.

EC(3): How does the road system affect the distribution of benefits and costs among affected people?

The road system will have an economic impact upon several groups of people. If roads are not properly maintained and forest product purchasers or recreational users decrease their activities, some people may lose their jobs. If roads are maintained, this will be reversed and perhaps even more people can be hired. Also, people will be employed to do the maintenance.

Maintaining roads in certain areas will determine who benefits. Certain people will be affected by the maintenance/lack of maintenance in a given area. An example of this is a recreation area. The level of road maintenance would affect visitors traveling to recreational facilities. Rough, unmaintained roads will deter recreationists with low clearance or large recreational vehicles.

The commercial activities that are the most prominent in the MTNF include: timbering, mining, recreating (outfitters, concessionaires) and grazing. Based on the survey of county commissions, timbering was cited as being the most dominant activity followed by recreation type activities. Approximately 79 percent of the county commissioners indicate that the county residents were very or somewhat dependent upon the forest for their livelihood.

Again, 79 percent of the county commissions surveyed said that the construction of additional roads would expand commercial forest activities, primarily because of better access.

Additionally, decreased road maintenance can result in increased vehicle operational costs for road users, who— in Mark Twain National Forest Service counties—have lower income levels than the average Missouri resident. A July 2002 study by the Washington, DC, based The Road Information Program concluded that driving on roads in need of repair and reconstruction is costing Missouri motorists \$2 billion annually in extra

vehicle operating costs, which equates to \$520 per driver. The study shows that Missouri motorists each pay more than twice the national average of \$259 per year. While this study looked at state roads, it provides an idea of the impact of an inadequately maintained road system.

COMMODITY PRODUCTION

TIMBER MANAGEMENT (TM)

TM 1) How does road spacing and location affect logging system feasibility?

Logging feasibility in the MTNF is most affected by whether the road system provides access. In most areas, timber harvesting is done by relatively small logging operations. Logs are harvested using chain saws, moved to loading areas with skidders and hauled out by truck. In the more rugged areas of the forest, the majority of the forest system roads are located on ridge tops. These ridge top roads are more durable than roads built on side slopes, valley bottoms and where flooding or drainage would cause damage and require frequent repairs. Most logging is done by skidding uphill to ridge top landings to be hauled out by truck on ridge top roads. The current road system's spacing and location provide adequate access for timber harvesting. Particularly when considering that there are numerous overgrown, non-system roads located throughout the forest, from past logging or hunting activities, that can be made serviceable with minimal effort.

TM 2 & 3) How does the road system affect managing the suitable timber base and other lands? How does the road system affect access to timber stands needing silvicultural treatment?

Road systems provide for faster and less expensive access to National Forest lands for a wide variety of forest management activities, including resource inventory data collection, law enforcement, fire suppression, watershed restoration, tree planting and thinning, and noxious weeds treatment. This analysis addresses Levels 3, 4 and 5 roads, which are used for all resource management activities. These roads provide access to Level 2 roads, which are generally used for timber management activities.

Depending upon the road use level, and resulting required width, an adequate network for management access must be balanced with the amount and type of land taken out of management to allocate to road use. A maintenance level 3 road with a 24' road prism, takes approximately five acres of land out of "production" per mile of road length.

An average road density of one mile of forest road per square mile of Forest land allows access for a range of recurring timber management activities and silvicultural treatments. Most ideally, well-planned ridge top roads are better suited to vegetation/timber stand management than lower valley and/or mid-slope roads, and are most stable in these locations. This stability allows minimum maintenance over time while allowing recurring

entries for recurring treatments without new disturbance or reallocation of land productivity class.

MINERALS MANAGEMENT (MM)

MM 1) How does road system affect access to locatable, leasable and salable minerals?

In the last 23 years, there have been 145 hardrock mineral (lead, zinc, copper, etc.) prospecting permits issued on lands managed by the Mark Twain National Forest. Only three of those (2 percent) have resulted in a lease to extract minerals. There are no salable minerals activities in the MTNF. An exploratory drilling program is on-going in parts of MTNF. Drill sites are positioned along existing roads whenever possible, but temporary access roads may be constructed in areas inaccessible to motorized vehicles. When this phase of operation is completed, the affected areas are restored as much as possible, to their original condition. This restoration is completed under the direction of the district ranger.

In addition to drill sites there are about 10 vent shafts located above ground on Forest Service lands, these sites involve about 3 acres of land in an open state and are all located along roads to insure easy access. Vent shafts are used for air exchange to underground mines and can also be used to access mines in the case of an emergency.

Current state, county, Forest Service, private and temporary roads are used to access these permitted drilling sites. The current road system provides adequate access. Any changes to the road system, especially road closures, could have an effect on access to leases and permitted areas.

RANGE MANAGEMENT (RM)

RM 1) How does road system affect access to range allotments?

Range allotments generally need only limited road access for maintaining constructed features like fences or water systems. However, access needed for hauling feed or shipping animals requires a permanent road system. There are range allotments in all of the ranger districts of the MTNF. The current road system provides adequate access for these operations as well as for permit administration. Road system changes, especially road closures, could increase costs for permit holders. Less direct access to range allotments would force those users to travel longer distances to care for their stock and complicate shipping and feeding operations.

WATER PRODUCTION (WP)

WP 1) How does the road system affect access, constructing, maintaining, monitoring and operating water diversions, impoundments and distribution canals or pipes?

The current road system provides adequate access for constructing, maintaining, monitoring and operation of water impoundments. Impoundments within Mark Twain National Forest do not serve public water systems.

WP 2) How does road development and use affect water quality in municipal watersheds?

The current road system does not affect water quality, as there are no municipal systems within the Mark Twain National Forest.

WP 3) How does the road system affect access to hydroelectric power generation?

There are no hydroelectric power generation plants within the Mark Twain National Forest.

SPECIAL FOREST PRODUCTS (SP)

SP1) How does the road system affect access for collecting special forest products?

Collecting special forest products often depends on using existing Forest roads. These activities typically do not support developing or maintaining roads. A number of laws and regulations govern the digging or taking of plants and plant parts in Missouri. Public lands in Missouri are managed by a number of agencies, and restrictions on the digging or taking of plants vary.

In the MTNF, the digging or taking of plants for personal consumption is allowed by permit, but commercial collecting is prohibited. The issuance of permits is administered at the district level, and policies for issuing permits can differ from district to district. No collecting is allowed within Wilderness areas. Only a few special use permits are currently being issued for special forest products such as mushrooms, ferns, herbs or transplants (such as native trees and wildflowers) in the MTNF. Generally, two to four permits are issued annually.

Some non-permitted collecting of plants and plant parts is occurring in the MTNF, including the illegal collection of plants and plant parts for commercial use. These activities are facilitated by the existence of system and non-system roads intersecting the Forest. Due to the size and remote nature of much of the MTNF, these activities are difficult to police.

The public uses most state, county, Forest Service, private and unclassified roads and trails in the MTNF to carry out both legal and illegal forest product collection activities. The current road system offers good access for gatherers of special forest products. Road system changes, especially road closures, would make it more difficult to harvest special forest products for both legal and illegal users.

SPECIAL USE PERMITS (SU)

SU1) How does the road system affect managing special-use permit sites (concessionaires, communication sites, utility corridors and so on)?

Special-use permits on Mark Twain National Forest lands allow communities, individuals, companies and organizations to access public land for uses such as telephone and electric utilities, recreation (including organized horseback riding, rappelling, canoeing and ATV club events), and other commercial and non-commercial activities. MTNF approved over 85 special-use permits in 2001 (some submitted in 2000) generating approximately \$2,500 in initial permit fees. On top of permit fees, MTNF requires that a percentage of revenue generated from certain fund-raising and/or for-profit events be returned to the Forest Service. Revenue collected from these special use events is approximately \$16,500 annually for the Mark Twain National Forest.

A large portion of these special-use permits is for road access across national forest land. The number of special-use permits has steadily increased over the past few years because more lending institutions are requiring written authorization from the Forest Service confirming access across Forest Service lands prior to making home loans. There has also been more demand for utilities and recreational opportunities by the growing population, and the current road system has provided adequate access for special-use sites. Sites are accessed not only by Forest Service roads, but also by county, state and private roads. Closing of Forest Service roads may adversely affect certain special-use sites, especially those with little or no access from the other public and private roadways.

GENERAL PUBLIC TRANSPORTATION (GT)

GT(1) How does the road system connect to public roads and provide primary access to communities?

Mark Twain National Forest roads connect many public roads owned and maintained by either the state of Missouri or county governments. State numbered and state lettered roads provide the primary access into the National Forest area with county and Forest roads providing entry directly into the Forest lands. Communities along these routes experience daily traffic from commercial and recreational users of the National Forest lands. The Mark Twain Forest road system does not provide any primary access routes to or between communities; however these communities use the Forest roads to access the National Forest. The following table lists many of the public roads identified as important for providing access to the National Forest and linking communities within the National Forest.

Table 3.1. Inventory of Roads by Congressionally Designated Boundary (Ranger District) Page 1 of 2

MTNF Unit	County	State & County Road Access	MTNF Maintenance Level 3 & 4 Roads
Fredericktown	St. Genevieve	WW	2199
	St. Francois	T, WW, CR: 256, 219	
	Madison	67, 72, J, NN, W, F, V, A, CC, E, O, CR: 208, 219, 229, 238, 241, 243, 244, 247, 248, 250, 252, 255, 256, 257, 308, 310, 314, 319, 404, 406, 408, 410, 411, 413, 415, 417, 425, 427, 429, 431, 508, 511, 512, 513, 518, 535	2120, 2196, 2510, 2510A, 2510B, 2510C, 2518, 2519, 2519A, 2520
	Iron	72, D, JJ, E, CR: 37, 110, 111, 113, 124, 125, 134, 206	2117, 2120
	Bollinger	O, A, CR: 328, 844, 846, 860, 862, 872	
Salem-Potosi	Washington	8, AA, P, C, Z, DD, Y, CR: 205, 206, 214, 217, 218, 601, 603, 604, 605, 607, 608, 636, 643, 645, 646, 648, 650, 651, 654, 656, 657, 658, 663	2258, 2268, 2275, 2293, 2391, 2392, 2423, 2438, 2505, 2695, 3003
	Crawford	8, 49, HH, BB, E, Y, Z, W, V, CR: 542, 544, 547, 550, 701, 705, 706, 707, 709, 711, 712, 713, 715, 716, 717, 721, 723, 724, 726, 804, 805, 807, 811, 813	2011, 2252, 2257, 2265
	Dent	32, 72, AC, B, MM, CR: 404, 428, 432, 438, 440, 443, 443A, 522, 524, 526, 528, 531, 532, 535, 538, 539, 553, 561, 562, 563, 564, 569	2240, 2257, 2340, 2341, 2346, 2358, 2360, 2362, 3901, 3902, 3903, 3904, 3906, 3907, 3908, 3909, 3911, 3912, 3913, 3919, 3920
	Reynolds	72, PP, UU, KK, TT, J, CR: 391, 526, 746, 800, 806, 816, 818, 822, 826, 832, 834, 836, 838, 842, 854, 856, 900, 902, 904, 906, 908, 910, 912, 928, 942	2234, 2307, 2314, 2349, 2525, 2648, 3901, 3902, 3903
	Shannon	A, P, CR: 235, 258, 277, 281, 283B, 284, 289	2193, 2221, 2301, 2306, 2307, 2865
	Iron	32, 49, A, O, Y, Z, DD, KK, CR: 1, 3, 5, 7, 8, 16, 20, 20A, 41, 50, 61A, 62, 65, 66A, 68, 69, 71, 73, 74, 75, 79, 80A, 82, 82A, 85, 89, 208	2228, 2231, 2241, 2359, 2363, 2391, 2454, 2768, 2774, 2776, 3001, 3001A, 3002, 3003
Willow Springs	Douglas	14, 76, 95, 181, AA, E, EE, W, AP, CR: 160, 164, 165, 167, 246, 258, 260, 269, 270, 273, 274, 275, 276, 277, 284, 289, 290, 360, 691, AP291, 14-279, 14-357, 14-285, 14-357, 181-282, 181-286	121, 121A, 122, 426,
	Howell	14, 76, AP, P, AM, Z, AA, T, CC, CR: 428, 458, 474, 513, 535, 549, 1030, 4390, 4820, 4870, 4910, 4990, 5120, 5200, 5210, 5280, 5310, 5320, 5470, 5570, 5610, 5690, 5710, 5830, 6140	108, 117, 424, 426, 744, 857
Cassville	Barry	39, 76, 86, E, F, J, M, P, RA, CR: 394, 766, E16	187, 197, 199, 1083, 1260
	Stone	13, 39, 86, H DD, OO, RB, CR: 391, 13350, Y14	189
Ava	Christian	125, H, T, DD, UU, CR: 12530, T9, T11, T12, T14, T128, UU15	533, 533A, 559, 570
	Taney	76, 125, 160, M, DD, FF, CR: 12520, 76280, 76290	149, 150, 154
	Ozark	95, D, Z	145, 147
	Douglas	CR: DD444	160
Cedar Creek	Boone	Y, AB, CR: 389	
	Callaway	54, F, H, J, Y, MM, WW, CR: 228, 237, 238, 246, 305, 315, 323, 325, 333, 334, 335, 347, 354, 356, 361, 388, 397, 398, 432,	1671, 1681, 1682

Table 3.1. Inventory of Roads by Congressionally Designated Boundart (Ranger District) Page 2 of 2

MTNF Unit	County	State & County Road Access	MTNF Maintenance Level 3 & 4 Roads
Houston-Rolla	Phelps	I-44, 63, J, K, M, P, T, AA, CC, ZZ, CR: 208, 283, 6040, 6070, 6080, 6110, 6120, 6130, 6370, 6380, 6390, 6410, 6450, 6590, 6630, 7140, 7170, 7210, 7220, 7230, 7240, 7250, 7300, 7320, 7360, 7380, 7400, 7460, 7480, 7490, 7500, 7520, 7530, 7550, 7570, 7610, 7630, 7640, 7670, 8500, 8510	311, 1516, 1530, 1576, 1593, 1727, 1730, 1892
	Pulaski	I-44, 17, E, H, AB, NN, TT, CR: 269, 343, 345, 350, 355, 356, 360, 362, 650, 710, 712, 820, 820S, 840, 840G, 840P, 2850, 8405	240, 272, 342, 1508, 1727, 1730
	Laclede	32, K, O, U, AC, AD	5108, 5136
	Wright	95, H, KK	
	Texas	17, 32, AE, AF, AH, AW	204, 211, 227, 241, 274, 1502, 1502A, 1508, 3549
Doniphan-Eleven Point	Shannon	19, 60, E, H, Y, W, DD, CR: 563	3159, 3167, 3169, 3170, 3172, 3173, 3179, 3270, 4249
	Carter	60, C, F, J, M, Y, P, CR: 167, 169, 231, 246	3152, 3169, 3248, 3249, 3285, 4144
	Oregon	19, K, AA, CR: 127	3142, 3150, 3152, 3155, 3156, 3170, 3173, 3174, 3188, 3189, 3190, 3224, 3249, 3284
	Ripley	160, C, J, V, Y, CR: C7	3140, 3142, 3143, 3144, 3145, 3148, 3157, 3210, 3213, 3220, 3222, 3224, 3225, 3240, 3412, 4349, 4785, 4949,
Poplar Bluff	Carter	60, A, B, H, K, N, V, DD, CR: 237, 239, 255, 256, 257, 263, 339, 340, 344, 350, 361, 364, 365, 366, 367, 443, 854	3766
	Wayne	49, 67, 172, A, D, P, U, V, W, BB, FF, CR: 361, 363, 371, 372, 376, 377, 378, 403, 406, 407, 410, 417, 421, 424, 427, 430, 435, 443, 526, 527, 528, 529, 530, 534, 536, 543, 546, 547, 548, 549, 550	2997, 3551
	Butler	60, 67, O, W, T, JJ, KK, PP, TT, CR: 402, 404, 408, 410, 411, 412, 415, 417, 418, 420, 421, 425, 426, 427, 428, 432, 434, 448, 449, 504, 506, 523, 525, 533, 534, 535, 540, 543, 548, 552, 553, 573, 574, 575, BC419	3100, 3107, 3110, 3112, 3899

Source: MRPC Analysis, Nov.-Dec. 2002

GT 2) How does the road system connect large blocks of land in other ownership to public roads (ad hoc communities, subdivisions, in-holdings, and so on)?

The amount and distribution of private and other ownership lands vary across each of the nine geographic areas of the Mark Twain National Forest. Most of these lands are reached by state, county and private road access. Some Forest system and unclassified roads are used to access private property. When landowners desire access to land from a road not on the National Forest system, they are generally asked to apply for a special use road permit whether or not the road is open or closed to the public. Landowners are then responsible for the maintenance of the road. If access is being provided by a state or county road, the Forest Service may not be obligated to provide additional access through federal lands.

When larger developments—such as subdivisions and major industrial development—occur that increase traffic significantly exceeding that generated by users of the National Forest, agency policy is to pursue turning jurisdiction of that forest road over to a county or state agency. Mark Twain National Forest does not currently have many large subdivisions requiring access; however, there is a noticeable trend of more people wanting to live within or adjacent to the National Forest, which may affect the need for access to private lands in the future.

The Salem and Potosi Ranger District boundary encompasses roughly one-third private lands. State and county roads provide access to almost all private land in this district with Forest roads connecting smaller in-holdings to the county and state road system. The communities of Bunker and Viburnum lie within the district and are located along state routes. The cities of Salem, Steelville, and Potosi are adjacent to the National Forest and are connected by state routes running through the ranger district.

Most of the land within the Cedar Creek unit boundary is privately owned. There are few Forest system roads in this unit. Access to private and Forest land is mainly by state and county roads. There are no communities within the Cedar Creek unit and state routes connect the cities of Columbia, Holts Summit, and Fulton, which surround the unit.

The Fredericktown unit contains approximately half private land with access to private lands provided by state and county roads. There is little private land that is completely surrounded by Forest land, and county and Forest system roads connect most of these small in-holdings. The city of Marquand is located within the unit and is accessed by state and county roads. The cities of Fredericktown and Ironton are adjacent to the National Forest and are connected by state routes running through the unit.

Over half of the Houston-Rolla Ranger unit is private land. Mainly state and county roads connect these lands. Forest system roads access some scattered in-holdings. Rolla, Doolittle and Waynesville/St. Robert are adjacent to the National Forest and are connected by Interstate 44 or other state and county roads. Smaller communities lie within the unit, but are connected by state and county roads rather than Forest system

roads. Fort Leonard Wood lies within the unit boundary and is accessible by state routes leading to fort entrances.

The Poplar Bluff Ranger District is mostly National Forest land. Public and Forest system roads access the private land located in the district. Many small in-holdings are reached solely by Forest system roads. The small communities of Greenville, Williamsville, and Ellsinore are located within the ranger district and are located along the state road system. Forest system and county roads provide access from the communities to other portions of privately owned land. The city of Poplar Bluff is adjacent to the National Forest and is connected to the district by state highways.

The Ava unit contains over half private land. State and county roads provide the main access to these private lands. Only a small portion of private land is surrounded by National Forest and relies on Forest Service roads for access. The northwest end of the Ava unit has seen an increase in more newly developed subdivisions and new homes being built on private land within the Forest Service boundaries. This is largely sprawl from the Springfield/Branson area. This increased development produces more traffic, typically moving at increased speeds. The cities of Ava, Ozark, Forsyth, Taneyville, and Theodosia are adjacent to the unit and connected by state routes to the Forest.

Approximately two-thirds of the Cassville unit is private land. The main access to private lands is through state and county roads. Very little private land is accessed strictly by Forest system roads. Some areas would be accessed by special use permit, if entry were required. Kimberling City is the largest of the many communities along Table Rock Lake within the National Forest unit, and all are located along state system roads. The cities of Branson and Cassville are adjacent to the unit and connected by state highways to the Forest.

The Doniphan-Eleven Point Ranger District is about one-third private land, which is accessed mainly through state and Forest system roads. Scattered in-holdings are reached primarily by Forest system roads, as there are few county roads in this district. Portions of the Ozark National Scenic Riverway lie within the district, and county and Forest system roads provide access. The city of Winona is located within the district and the cities of Van Buren, Doniphan, and Birch Tree lie adjacent to the Forest, and are connected by state routes running through the ranger district.

Approximately half of the Willow Springs unit is private land, which is accessed mainly through state and county roads. There are several private in-holdings that rely on Forest Service roads for access. There are no communities within the Willow Springs unit and state routes connect the adjacent cities of West Plains, Mountain Grove, Cabool, and Willow Springs to the Forest.

GT 3) How does the road system affect managing roads with shared ownership or with limited jurisdiction?

State, county and Forest roads are maintained by each jurisdiction within the Mark Twain National Forest. There are no cooperative agreements between two or more jurisdictions for the management of any roads in the National Forest. There are occasionally cost-share agreements for maintenance of roads with public or private landowners within the Forest. There is currently only one such agreement in the Fredericktown Ranger District between the Forest Service and St. Genevieve County where the Forest Service provides aggregate for the Forest road and the county maintains the road by blading on a regular basis. Special use permits holders are responsible for the maintenance of non-system Forest Service roads whether they are open to the public. In some instances, ownership of a road has changed, such as former Forest Service roads that have been deeded to a county. This is sometimes done when private use and private road needs outweigh public use and access to the Forest. When a Forest Service road is deeded to a county, the deed includes a provision that allows the road to revert to the Forest Service when the county no longer maintains the road.

GT 4) How does the road system address the safety of road users?

The Forest Service currently uses designated road maintenance levels to determine the maintenance needs of roads based upon use and traffic service demands. Level 3, 4, and 5 roads are open to public travel and maintained to be passable for four-wheeled standard passenger vehicles. There are no Level 5 roads in the MTNF. Design, maintenance and traffic controls on these levels of roads all revolve around the safety of users. Most Forest roads managed at maintenance level 1 and 2 and unclassified roads experience no traffic or only minor traffic except for periods of commercial use. Additional road maintenance may be required to safely accommodate increased traffic volumes during times of commercial use, and this maintenance is the responsibility of the commercial user.

Seasonal restrictions may also be placed on any level of road to prevent undue wear and tear by large commercial vehicles or to prevent road damage while roads are drying out in the spring. The Forest Service uses a standard road sign to designate roads at levels 1 through 5, but does not use signage on unclassified roads, as the public is not allowed on these roads. Forest Service road maps help drivers identify which roads are open to public traffic and which are not.

ADMINISTRATIVE USES (AU)

AU 1) How does the road system affect access needed for research, inventory and monitoring?

MTNF requires that specific research projects, such as the subjects listed on the FOREST PLAN III-6 to III-12, which are focused on unique Forest conditions, be conducted to improve the informational and technological database used in the management of the MTNF.

Most research projects are conducted within the Sinkin Experimental Forest on the Salem District and it has its own road system (Level 3). Those roads, which are gated, however, are open to the public during the modern firearms deer-hunting season. The current road system provides the access needed to conduct all research activities listed on FOREST PLAN IV-73 to IV-74.

Special use permits are issued to colleges, universities or individuals who wish to pursue research projects on the MTNF. Most of these special permitted research projects make use of Level 2 roads and would not be affected by road closures.

The current road system also provides access for project-driven inventories. However, if there was increased attention to heritage (cultural resources) values, it would result in added emphasis on consultation with the Missouri Department of Natural Resources State Historic Preservation Office (SHPO) and others interested in the disposition of heritage resources on public lands. Heritage values would focus more on surveys designed to expand the Forest database of heritage sites rather than primarily on project-driven inventories. If that were the case, increased activities could require more temporary road access for the duration of the project. Most archeologists would prefer to see temporary roads closed once surveying is completed to protect the value of the site.

Monitoring is done to observe or record the results of actions. This consists of collecting information from selected sources on a sample basis. There are two considerations that determine monitoring requirements. They are: 1) monitoring needs required by the National Forest Management Act, and 2) additional considerations found to be significant and linked to the resolution of specific public issues, management concerns, resource development opportunities and the corresponding environmental effects. Road access affects these inventories and field monitoring. The current road system provides adequate access for these activities. Any changes to the road system, especially road closures, could have an adverse effect by increasing time and cost for field activities.

AU 2) How does road system affect investigative or enforcement activities?

Forest Service law enforcement agents are faced with a growing workload paralleling the increase in Forest recreation users. The Forest Service has entered into cooperative agreements with 15 counties and one city and is also receiving assistance from the Missouri State Highway Patrol and the South Central Drug Task Force. Both Forest Service and non-Forest Service law enforcement personnel require a road system that enables them to patrol and respond to emergency situations and illegal activities on the MTNF. On the other hand, expanded road access, particularly near towns, provides more opportunities for illegal activities on the Forest.

Forest Service agents can also use all-terrain vehicles (ATVs) cross-country for administration where the public cannot. The Cedar Creek area has limited access for emergency rescue due to fenced grazing allotments.

Illegal activities currently found on MTNF are varied and they include, but are not limited to:

- Unauthorized use of OHVs driving on closed Level 1 roads and across country;
- Unpermitted ATVs on forest roads;
- Driving and hunting activities of unpermitted outfitters and guides;
- Theft of forest products (merchantable logs, firewood, roots, transplants, Christmas trees, etc);
- Possession of alcohol by minors and illegal drug use;
- Manufacture of illegal drugs, especially methamphetamine, and cultivation of marijuana;
- Arson;
- Vandalism (recreation facilities, gates, signs and heritage sites);
- Illegal dumping of household and business-related trash, tires and white goods; and
- Residential occupancy exceeding 14 days.

The current road system provides the access needed to comply with the management direction given in the FOREST PLAN on pages IV-76 to IV-77 and provides local law enforcement personnel the access to respond to their calls. However, according to the survey of county officials in the MTNF, not all county governments agreed with this conclusion. Some 67 percent of the counties surveyed said, from a law enforcement perspective, access should be increased to allow for better surveillance and better visibility. One county indicated as more people would be using the Forest, less criminal activity would occur as there would be more citizens with “watching eyes.” Dent County officials said that if road access were more limited, there would not be as much illegal drug manufacturing activity. At the same time, Phelps County commissioners indicated that there are not enough roads to provide adequate access when enforcement needs arise. There were also comments on the confusion created because Forest Service roads do not use the same numbering system as county roads on the emergency 911 systems. Obviously there are conflicting opinions in this area.

PROTECTION

PT 1) How does the road system affect fuels management?

The current road system consists of state, county, Forest Service, unclassified and private roads. These roads provide adequate access to the analysis area for fuels management activities. The only exception would be the relatively limited unroaded areas designated as wilderness. With the oak decline occurring in much of the MTNF, salvaging of the dead and dying timber will make a positive impact in the fuels management program and help to alleviate the intensity of any future fires. The harvesting of these trees is currently by a variety of harvest methods. Other fuels management activities would include prescribed burning and mechanical treatments of logging slash. Roads in the analysis area would be used by agency personnel to access fuel treatment sites and for fire lines.

PT 2) How does the road system affect the capacity of the Forest Service and cooperators to suppress wildfires?

The current road system provides adequate access for ground-based fire suppression forces to manage wildland fires. There may be some instances where existing roads would be beneficial as fire breaks.

PT 3) How does the road system affect risk to firefighters and to public safety?

Fire suppression and prescribed fire are inherently hazardous duties. By providing access to Forest lands, the roads also provide increased risk of fire occurrence. The road system allows access that may lead to accidental fires started by campers, day visitors and contractors working in the Forest. The road system provides easy access to arsonists who intentionally start fires. Any fire on National Forest Land increases risk for both fire fighters and the general public. Potential risks would include smoke, vehicle accidents, falling snags, entrapment, etc. At the same time, the roads system provides the access necessary for the public to use and enjoy the Forest and for firefighters to combat wildfires.

Some Forest Service roads are built on narrow, hilly terrain, including ridges. Steep, hilly terrain increase the risk for vehicle accidents, especially at times of reduced visibility due to darkness, smoke and fog.

PT 4) How does the road system contribute to airborne dust emissions resulting in reduced visibility and human health concerns?

Dust emissions from the Forest road system are caused by traffic on unpaved roads. These effects are typically localized and temporary and are currently not a problem within the analysis area. For the most part, the road system is not heavily traveled. In addition, the region is not generally dry enough, for long-enough time intervals, to result in airborne dust emissions to become a problem for reduced visibility and health concerns. Relatively abundant and frequent precipitation, particularly during the summer months, tends to prevent road surfaces from drying to a significant degree for extended periods.

RECREATION

UNROADED RECREATION (UR) and ROADED RECREATION (RR) questions are addressed together.

Please note: Along with other sources of information, the county commissions for counties which contain Mark Twain National Forest land were surveyed to obtain their input into these responses.

UR1& RR1: Is there now, or will there be, in the future excess supply or excess demand for unroaded or roaded recreation opportunities?

According to county surveys and the Missouri Statewide Comprehensive Outdoor Recreation Plan (SCORP), there is an excess demand for both unroaded and roaded recreation opportunities on the Forest. The SCORP for 1996 through 2001 lists expansion of existing recreation facilities as its number one priority need. The expanded facilities must be consistent with the carrying capacity of the land and with user demand for those facilities. The number two priority is to provide better maintenance and repair of facilities.

According to the 1999-2000 National Survey on Recreation and the Environment, over 97% of Americans participated in at least one outdoor activity during the year 2000. Walking continues to be the single most popular of activities, although birding is growing fast and joining the ranks of activities Americans most favor. The results of this survey indicate a rapid rise in popularity of viewing/learning about nature, trail, motorized and camping activities.

The 1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation for Missouri, conducted by the U.S. Fish and Wildlife Service, focuses on 1996 participation and expenditures of U.S. residents 16 years of age and older. In 1996, there were approximately 1.2 million anglers, 552,000 hunters, and 1.9 million wildlife watchers. Access for recreational activities, along with many others, is provided by the road system on the National Forest. Recreation has increased over the years and so has the need for roads to safely transport travelers through the forestlands.

Residents of the Highlands' "draw area" exceed the national average in percent of population participating in every major category of outdoor recreation available in the Highlands. More than 90 percent of the draw area population participates in activities associated with viewing and learning about nature and human history, such as sightseeing, bird watching, and visiting historic sites. Approximately 40 percent participate in fishing, 41 percent in boating, 31 percent in camping, and 14 percent in hunting.

A survey of county commissions, conducted by regional planning commissions for this study, also indicates that more unroaded and roaded recreation areas are needed. The Forest is experiencing an increased volume of visitors from cities. Most counties feel that the MTNF should develop more recreation areas on the land currently managed by the Forest Service. They also believe that the MTNF should develop a new mission statement to clearly state the Forest Service objectives. Counties also indicated that they do not want more roaded recreation areas without increased supervision and maintenance.

UR (2) & RR (2): Is developing new roads into unroaded or roaded areas, decommissioning of existing roads, or changing the maintenance of existing roads

causing substantial changes in the quantity, quality or type of unroaded or roaded recreation opportunities?

The county commissions agree that the development of new roads would affect the quantity or type of unroaded/roaded recreation opportunities. They also agree that the quality of the opportunities would be affected, because it would offer more access for more people. The quality impact would be dependent upon the user, but most felt it would be a positive impact. They agreed that local input should be used to make the final decision on whether to develop new roads.

Obliteration of existing roads and revegetation to a natural condition (decommissioning), according to those surveyed, would most likely affect the quantity, type and quality of unroaded/roaded recreation opportunities. The consensus was that this would lessen accessibility and would not be good for public relations. Most users want to be able to drive as close as possible to the activity area, so decommissioning roads in highly used areas should be avoided.

According to the survey, changes in the maintenance of existing roads would also affect the quantity or type and quality of unroaded/roaded recreation opportunities. The counties would anticipate complaints about limited access, rough roads and vehicle damage. Maintenance in roaded areas is generally good now, but less maintenance would make it more difficult for both local and non-local users to access sites and more maintenance will increase their accessibility. Access is already difficult in unroaded areas, as intended. Reduced maintenance will be a further hindrance to use, crime fighting, fire suppression, etc.

When road maintenance is not kept up-to-date or if roads are decommissioned, traveling across the forest will be less comfortable, resulting in users choosing the better-maintained roads, thus increasing use pressure on those roads and the surrounding areas.

UR (3) & RR (3): What are the effects of noise and other disturbances caused by developing, using and maintaining roads on the quantity, quality and type of unroaded/roaded recreation opportunities?

It is rare that there are any road-related adverse effects of noise or other disturbances on roaded or unroaded recreational opportunities. Most effects of road management activities can be mitigated at the project level.

UR (4) & RR (4): Who participates in unroaded/roaded recreation in the areas affected by constructing, maintaining and decommissioning roads?

According to the county commissions surveyed, the level of usage in the unroaded Forest areas is moderate to heavy. Use is heaviest in both unroaded and roaded areas during deer hunting season. The roaded areas show heavier use, especially during hunting season. The MTNF is used by most ethnic groups, age groups, and both sexes and by many

organizations. The greatest use is by adults from 30-65 years of age, predominantly white.

Activities that most users participate in on roaded areas include: hunting, hiking, driving ATVs, camping and equestrian. In unroaded areas, users participate in hunting, hiking, equestrian, driving ATVs (though illegal) and backpacking. Other recreational uses in both roaded and unroaded areas include: picnicking, fishing, sightseeing, cycling, caving, bird watching, photography, walking/running and boating.

UR (5) & RR (5): What are these participants' attachments to the area, how strong are their feelings, and are alternative opportunities and locations available?

Those who oppose road closures are usually from the local area, while those who support road closures are from urban areas. Local residents seem to have a very strong feeling of entitlement when it comes to using roads on the Mark Twain National Forest, since they live and work in such close proximity to the Forest and would be more likely to experience a direct effect from such closures.

According to the county surveys, the participants of recreational activities have a strong attachment to the area – an average of 8.2 on a scale of 10, with 10 being the strongest attachment. Although they indicated that there are other nearby public locations, both roaded and unroaded, where their recreational activity of choice can be enjoyed, most people who use the Forest are attached to specific areas and do not wish to relocate their recreational activities.

PASSIVE-USE VALUE (PV)

PV 1) Do areas planned for road entry, closure or decommissioning have unique physical or biological characteristics, such as unique natural features and threatened or endangered species?

There are no known or documented unique natural features or threatened and endangered wildlife species within the Forest that would be affected by maintenance level 3 and 4 roads. There are no road entry, closure or decommissioning activities planned at this level. Any such activity and its anticipated direct, indirect and cumulative effects would be fully evaluated in a project level analysis.

PV 2 & 3) Do areas planned for road construction, closure or decommissioning have unique cultural, traditional, symbolic, sacred, spiritual or religious significance? What, if any, groups of people (ethnic groups, subcultures, and so on) hold cultural, symbolic, spiritual, sacred, traditional or religious values for areas planned for road entry or road closure?

There are no maintenance level 3 or 4 road entries, closures or decommissioning activities planned at this level. All anticipated direct, indirect and cumulative effects would be fully evaluated at the project level, should such activities be considered.

PV 4) Will construction, closing or decommissioning roads substantially affect passive-use value?

Of the 29 county commissions surveyed, 19 (66 percent) said that road construction, closure or decommissioning would significantly affect passive-use values. Ten commented that closure or decommissioning activities would be perceived as restricting or limiting access. One comment suggested that new roads would increase use. Passive use would become active use.

SOCIAL ISSUES (SI)

SI 1 & 2) What are people's perceived needs and values for roads? How does road management affect people's dependence on, need for and desire for roads? What are people's perceived needs for access? How does road management affect people's dependence on, need for and desire for access?

Of the 29 county commissions surveyed, all (100 percent) said that roads were primarily used by residents of the local communities. Secondly, the roads serve the needs of visitors and tourists, and finally commercial users. Nearly half of the county commissions (47 percent) say that people value access because of the public ownership of the land, managed by the Forest Service.

In some case, Forest Service roads are used to access private residences and land. However, the survey also indicated that the need for access tied very closely to recreational and social activities. The top five activities for which people desire access is hunting, hiking, horseback riding, camping and ATV riding. In some situations, the National Forest is the preferred site for such activities because of its close proximity, abundance of land and low-cost or no-cost usage.

SI 3) How does the road system affect paleontological, archaeological and historical sites?

Direct effects to heritage resources as a result of road reconstruction activities result from the disturbance of the ground surface. Archaeological sites in the Ozarks are typically fairly shallow. It is quite common for cultural artifacts to be found no deeper than 30-40 cm, and at many prehistoric sites several thousand years of occupation may be present in a mere 30 centimeters (cm) of deposition. Historic period sites tend to be even shallower, with most deposits on the MTNF typically being no deeper than 10 cm. In addition, at historic sites there are often low surface features, such as rock foundations, that could also be easily disturbed. As a result of being so shallow, archaeological sites in the Ozarks can be severely impacted by activities that disturb the ground surface.

Indirect effects are those effects that may occur after the project has been completed, but can be considered a result of project implementation. In the case of road construction

activities, the most likely indirect effects to heritage resources include erosion of the cultural deposits and the increase of public accessibility to the sites.

In regard to increased access to sites, studies have shown that the frequency of the vandalism and unauthorized excavation of archaeological sites can be influenced by accessibility. The more accessible a site is, the more likely it is to be subjected to vandalism and unauthorized excavation. Such occurrences are a documented problem on the MTNF.

SI 4) How does the road system affect cultural and traditional uses (such as plant gathering and access to traditional and cultural sites) and American Indian Treaty rights?

There are no known or documented cultural and traditional uses by recognized Native Americans on the Forest.

SI 5) How are roads that are historic sites affected by road management?

Some roads are considered historic sites under the National Historic Preservation Act (NHPA). None of the maintenance level 3 and 4 roads on Mark Twain National Forest fall under NHPA. Some historic roads in Missouri are in close proximity to the National Forest and the management of those roads—typically by the Missouri Department of Transportation— could impact the Forest, either positively or negatively.

At this time, there are no state roads within the Forest that fall under the NHPA. The Missouri Department of Natural Resources is considering a request to have Route 66 included on the NHPA list.

SI 6) How is community and economic health affected by road management (for example, lifestyles, businesses, tourism industry, infrastructure maintenance)?

The current road system provides for the economic health for the project area. Communities that are recreation and retirement oriented benefit from Forest Service roads as well as communities dependent on timber harvesting and mineral extraction. The FOREST PLAN on page IV-13 describes the management direction desired and areas to be considered for determining the minimum road system for the MTNF.

The survey of county commissioners indicated that they believe their constituents would respond negatively to any road closing or decommissioning activities as well as decreased maintenance. As stated earlier, visitors with low clearance vehicles and large recreational vehicles have limited access to some areas of the Forest if Level 3 and 4 roads are not maintained adequately. If poor road conditions deter tourism, this can translate into lost sales revenue for area businesses and lost sales taxes for local counties.

Additionally, decreased road maintenance can result in increased vehicle operational costs for road users, who—in Mark Twain National Forest Service counties—have lower income levels than the average Missouri resident. A July 2002 study by the Washington,

DC, based The Road Information Program, concluded that driving on roads in need of repair and reconstruction is costing Missouri motorists \$2 billion annually in extra vehicle operating costs, which equates to \$520 per driver. The study shows that Missouri motorists each pay more than twice the national average of \$259 per year. While this study looked at state roads, it provides an idea of the impact of an inadequately maintained road system.

SI 7) What is the perceived social and economic dependence of a community on an unroaded area versus the value of that unroaded area for intrinsic existence and symbolic values?

Public opinions and attitudes about roads are quite diverse and can be highly charged. Typically rural area residents want access to the forest, while urban residents want to preserve the forest and advocate reduced access to accomplish that goal.

The survey of county commissions confirmed the strong sense of ownership that area residents have toward Forest Service lands. Road closures typically bring out strong opposition, and it ties back to the feeling of ownership and the belief that the restriction of access infringes on their rights.

SI 8) How does road management affect wilderness attributes, including natural integrity, natural appearance, opportunities for solitude and opportunities for primitive recreation?

The first wilderness, Hercules Glades, was designated in 1976. There were a total of ten areas on the Mark Twain evaluated during RARE II. Six of these areas were subsequently designated as Wilderness. Three of the four remaining RARE II areas were allocated to the 6.1 management prescription in the Forest Plan; the other was allocated to the 3.4 management prescription and is now heavily roaded. The Sierra Club in Missouri identified five additional areas on the Mark Twain National Forest it considers worthy of protection. These areas were allocated to the 6.1 management prescription.

The MTNF has seven designated wilderness areas under the provisions of the Wilderness Act of 1964, totaling approximately 63,400 acres. These wilderness areas are Hercules Glades in Taney County (12,314 acres), Bell Mountain in Iron County (8,977 acres), Piney Creek in Barry and Stone Counties (8,112 acres), Rock Pile Mountain in Madison County (4,089 acres), Devil's Backbone in Ozark County (6,595 acres), Paddy Creek in Texas County (7,019 acres), and Irish in Oregon County (16,277 acres). These wilderness areas are allocated under the prescription 5.1 in the Forest Plan (See wilderness area maps 3.1-3.9).

Maintenance level 3 and 4 roads in these areas preceded the wilderness designation. These roads will impact opportunities for solitude, especially where these roads border wilderness areas. Visitors are likely to hear traffic noises. Paddy Creek Wilderness area in Texas County is near Fort Leonard Wood, and visitors in that wilderness area are likely to hear bomb-training runs from time to time.

SI 9) What are the traditional uses of animal and plant species within the area of analysis?

Individuals and communities can depend socially, culturally and economically on certain plants and animal species. In Missouri, hunting and fishing are popular social activities across the state and especially in the Forest. Deer and turkey hunting are extremely popular, and the Forest is heavily used during these seasons. For some visitors, the Forest is the only place available for them to enjoy such activities. Fishing is a popular summer sport. From an economic perspective, cordwood cutting is common in southern and south-central Missouri, and some families and communities are dependent on the income produced from timber cutting in the National Forest.

Maintenance Level 3 and 4 roads typically provide access to Level 2 and special use permit roads, where hunting, fishing and timbering occur.

SI 10) How does road management affect people's sense of place?

The consensus of county commissioners surveyed indicated that they believe their constituents would oppose the closing and decommissioning of roads, and in some cases would strongly oppose such action. This would indicate a strong sense of place among area residents and who believe that access via roads is an integral part of the forest system. There is a sense of ownership among residents of counties containing National Forest land. Two commissions expressed concern that decommissioning would “devalue” the National Forest.

CIVIL RIGHTS AND ENVIRONMENTAL JUSTICE (CR)

CR 1) How does the road system, or its management, affect certain groups of people (minority, ethnic, cultural, racial, disabled, and low-income groups)?

The Mark Twain National Forest is located in 29 counties in Missouri. Based on 2000 Census data, the average population of those counties is 28,855, considerably less than the average county population in the state, which is 48,235. The MTNF counties average 44 people per square mile while the state average is 81.2 people. Residents of these counties are 95 percent white with an average age of 38.1 years, slightly older than the state average.

These counties are poorer than the average Missouri county as well. The average median household income for these counties is \$26,165, nearly \$11,800 less than the state average median household income. Fifteen of the 29 counties have average incomes less than \$25,000.

Some 15 percent of the residents in this 29-county area are below poverty; 26 percent of the children live in poverty. Twelve of the counties post a poverty rate of 20 percent or

more. The average unemployment rate ran about 2 percent more than the state average for 2001 at 6.7 percent.

According to the survey, the roads system in the Forest is used by all groups of people. Some counties believe that lower income users may value the road system slightly more, because it offers them opportunities at low/no cost. This seems reasonable as lower income, local residents are more likely to subsist off the land as hunters and gathers, primarily of fuel wood. They also feel that people who are disabled and/or elderly are restricted in their use of the Forest when roads are closed.

Changes in the road system or its management, including closing or decommissioning of any of the roads would have the same effect on all groups of people, including minorities, ethnic, cultural, racial, disabled and low-income groups. The exception to this might be low-income families that are dependent upon forest products for their livelihood, and the disabled, who may be more adversely affected as additional closures would affect their hunting/recreational opportunities.

People in some of the analysis area tend to be very independent and highly protective of their private property rights. Many are from fourth and fifth generation families that have strong ties to the Ozark and Missouri cultures, with strong roots in the land and a tradition that favors growing up and staying in the local area. Many have a suspicion of the Federal government, and see any restriction in the use of public lands as the first step towards exclusion of all human use of public lands and eventually complete regulation of all private lands as well. Many believe that environmental groups and the United Nations are manipulating the Forest Service into restricting use of public lands.

Much of the controversy surrounding roads on the Mark Twain National Forest involve the non-system roads. These are old roads that were constructed or developed through use before the land was under Forest Service management or prior to developing the Forest Plan in 1986. These roads have been identified as not needed for Forest Service management and are not maintained.

Chapter 5: Describing Opportunities and Setting Priorities

Purpose and Products

The purpose of this step is to:

- Compare the current road system with what is desirable or acceptable, and
- Describe options for modifying the road system that would achieve desirable or acceptable conditions.

The products of this step are:

- A map and descriptive ranking of the problems and risks posed by the current road system,
- An assessment of the potential problems and opportunities of building roads in a currently unroaded area,
- A map and list of opportunities, by priority, for addressing important problems and risks, and
- A list of recommendations.

Problems and Risks Posed by the Current Road System

Does the existing system of roads create an unacceptable risk to ecosystem sustainability?

Existing maintenance level 3 and 4 roads create minimum risk to ecosystem sustainability.

Can the maintenance requirements of the existing system be met with current and projected budgets?

The MTNF annual road budget has been flat for several years. Thus, maintenance level 3 and 4 roads have been receiving minimum, not optimum, maintenance. This has resulted in a backlog of deferred maintenance. Significant changes in the annual road budget are not anticipated.

Are some existing roads not needed to meet projected access needs?

None of the existing maintenance level 3 or 4 roads have been identified as not needed at this time. However, unknown future events could determine a road is not needed for access. For example, the long-range plan of a recreation area could change the access needed at the site.

If new access is proposed, what are the expected benefits and risks?

Currently, no new maintenance level 3 or 4 roads are planned. Benefits and risks would be evaluated at the project level if any changes were proposed in the future. For example, the acquisition of property may drive the need for new on-site access.

What opportunities exist to change the road system to reduce the problems and risks or to be more consistent with Forest Plan direction and strategic intent of the roads system?

The following changes to the maintenance level 3 and 4 road system could reduce known problems and risks:

- Pursue additional sources of funding to reduce deferred maintenance projects.
- Improve stream crossings and drainage and erosion control features in order to reduce soil erosion, sedimentation, and negative impacts on aquatic species.

The following changes could be more consistent with Forest Plan direction and intent of the road system:

- The Forest Plan needs to use the latest Forest Service terminology, classification system, handbooks and manuals to describe its current and desired transportation system. The transportation atlas should be a dynamic system based on the access needed for a variety of natural, social, and economic reasons. Current databases and management tools, such as INFRA and GIS should be used store, manage, and update data about the road system.
- Density limits need to be reevaluated and substantiated. Current methods of determining road density are questionable. Actual density limits should be based on current environmental, social, and economic factors.
- Continue to grant county road easements on those Forest roads whose primary traffic is non-Forest related.
- Determine the long-range plan of developed recreation areas. Some may possibly be improved, while others could be permanently closed.
- Monitoring and evaluation of surface erosion and sedimentation needs to be conducted.
- Monitoring and evaluation of road closure methods needs to be conducted. Determine which method(s) is most successful and cost effective. Prioritize the order in which non-system roads should be closed.
- Monitor and evaluate the use of roads by OHVs in nonmotorized management areas.

Are additional roads or improved roads needed to improve access for forest use or protection, or to improve the efficiency of forest use or administration?

No additional maintenance level 3 and 4 roads are proposed at this time. Should additional land be acquired, additional roads may be necessary and would need to be evaluated dependent upon on the land acquisition. Since maintenance funds are inadequate to meet existing maintenance needs, careful consideration should be given to

system expansion. The Forest Plan states some road construction goals, which would lead one to believe that additional roads are needed. It is not known at this time to what degree that goal has been accomplished, but based on this analysis, no new maintenance level 3 and 4 roads are needed given the present situation. Generally, the existing maintenance level 3 and 4 roads should continue receiving annual or regularly scheduled maintenance. However, some existing maintenance level 3 and 4 roads are candidates for county road easements. A few roads at administrative sites need to have their parking capacity expanded. (See individual road comments in the road inventory in Appendix 4.)

Overall Priorities for the Mark Twain Roads Analysis

During the course of completing this analysis of maintenance level 3 and 4 roads, data was gathered on items that need to be completed on the FS road system. These comments are displayed in Table 7.3 in Appendix 4. The highest priorities for maintenance level 3 and 4 roads are:

- Continue annual and regularly scheduled maintenance items needed on and along roads, such as; surfacing materials, mowing, limbing, signs and drainage features.
- Designate those maintenance level 3 & 4 roads that would be good candidates for Public Forest Service Roads (PFSRs) and county roads for Forest highways. This could result in additional road funding.
- Ensure that existing or future county roads through the National Forest have a deed of easement.
- Improve stream crossings to reduce soil erosion, sedimentation, and negative impacts on aquatic species from Forest Service and other federal, state, and county roads within the Forest. An inventory, assessment, and prioritized list of improvements to stream crossings and drainage and erosion control features along Forest roads needs to be completed. Pursue partnerships with other agencies to improve the same areas of concern along other federal, state, and county roads.
- Expand parking at administrative sites so as to meet current and projected needs.
- Determine the long-term plan for developed recreation areas, which could affect access needed at such sites.
- Develop accurate maps and determine that all Forest system roads are properly signed.

In addition, there are other priorities, outside the scope of this analysis, that need to be considered during project-level site-specific analysis or Forest Plan revision. These priorities are:

- Close and rehabilitate those non-system roads that are causing the most environmental damage.
- Addressing illegal OHV use on the forest and its impact to a variety of resources.
- Continued commodity production on the Forest, such as timber and minerals.
- Working closely with county commission so that they clearly understand PILT.
- Working with other agencies to reduce trash dumps on the Forest.
- Recognizing that access to the Forest is a key concern and that any proposal to reduce or eliminate access is controversial. This is most likely to occur with maintenance level 1 or 2 roads, as well as unclassified non-system roads.

Assessment of Building Roads in Areas with Road Management Restrictions

On the Mark Twain there are seven sensitive areas identified under Management Prescription (MP) 6.1; Swan Creek (Ava unit), Smith Creek (Cedar Creek unit), Van East Mountain (Fredericktown unit), Lower Rock Creek (Fredericktown unit), Spring Creek (Willow Springs unit), North Fork (Willow Springs unit), and Big Springs Addition (Van Buren unit). There are no maintenance level 3 and 4 roads within or adjacent to these areas, however a number of these areas are bordered by State Highways and/or county roads. Traffic volumes on these routes vary by season and locale.

Some of these areas were identified as Inventoried Roadless Areas (IRAs). IRAs are identified as those areas in a set of inventoried roadless area maps, contained in the Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000. There are four IRAs on the MTNF, they are Swan Creek, Spring Creek, Anderson Mountain and Big Creek. Under the 6.1 MP, there are no plans to build roads within these IRAs, though there may be maintenance level 3 and 4 roads adjacent to them. A description of the MP 6.1 is found in Chapter 2 of this document and in the Forest Plan, Chapter IV.

A description of the MP 5.1 is found in Chapter 2 of this document and in the Forest Plan, Chapter IV. The majority of roads accessing wilderness areas are maintenance level 4, since they are recreation access roads. There are three exceptions; the road south of the Piney Creek Wilderness (FR 187) and the roads north of Bell Mountain (FR 2228 and 2359). In addition, a number of the Wilderness areas are bordered by State Highways or county roads. Traffic volume on these roads vary by season and locale.

Specific road management standards and guidelines for MP 6.3, 8.1 and 9.1 are found in Chapter 2 of this document and in the Forest Plan, Chapter IV.

Chapter 6: Reporting

Purpose and Products

The purpose of this step is to:

- Report the key findings, opportunities and recommendations of the analysis.
- The products of this step are:
- A report including maps, analyses, and documentation of the roads analysis, and
 - Maps that show the data and information used in the analysis, and the opportunities identified during the analysis.

Key Findings, Opportunities and Recommendations

1. Counties and MTNF need to work cooperatively in identifying and numbering Forest Service roads so that one road does not have two numbers and to avoid confusion as to who has responsibility for the road.

The extent of this problem is not known. It would require a comparison of county road inventories and Forest Service road inventories to identify conflicting numbers or names. The problem could possibly be resolved or alleviated through improved relationships with local governments. The MTNF needs to develop accurate maps and determine that all Forest system roads are properly signed. Coordinate with agencies that use or manage road information.

2. Adequate roadways are needed to assure access to commodities, especially logging of timber, to ensure stable economies. It is important to maintain adequate access for vegetation management.

A major issue is public access to National Forest system lands. The survey of county commissioners clearly indicated that more access is believed to be better. The MTNF needs to improve their relationship with local governments and provide more outreach to educate local elected officials about the Mark Twain National Forest, its objective, goals and opportunities. Ongoing communication is key.

3. The federal government needs to re-evaluate Payment-In-Lieu-of-Taxes (PILT) payments, especially the formula used.

This roads analysis did not address this issue, but it is a major issue for county governments. Again, improved relationship with local governments would go far in helping counties understand the process. Again, Forest Service personnel could provide more outreach to educate local elected officials about the Forest, its

objectives, goals and opportunities and also explain how the payment formulas work and how local governments could provide ideas for changing the formula methods, if they believe them to be unfair to their jurisdiction.

- 4.** Explore methods of additional funding for maintenance and improvement of existing roads. Demonstrate need for improving roads. Transfer roads to other agencies when the majority of traffic on a road is non-Forest related, particularly where individuals need access to private property.

Maintenance costs and deferred maintenance schedules indicate that the budget for Mark Twain National Forest is inadequate to meet the present and deferred maintenance needs. The survey of county commissioners also confirmed a lack of satisfaction with road maintenance. Additional money or a redirection of resources will be needed if Forest Service roads are to be maintained at optimum standards.

Ongoing maintenance must be considered before any new roads are constructed or improved. Given the current status, additional 3 and 4 level roads may be needed only if the National Forest System acquires additional land. Parking at several administrative sites must be expanded to both government and employee owned vehicles.

Reevaluate cooperative road maintenance deposit formula to determine whether the Forest is collecting adequate funds to repair normal wear and tear on roads.

Nominate additional PFSR and Forest Highway candidates. Additional funding to improve these candidate roads will free up road maintenance dollars that can be spent on other Forest roads lacking annual maintenance and reducing the deferred maintenance backlog.

Ensure that existing and potential county roads within the forest have recorded deeds of easements. It needs to be clear who has jurisdiction and maintenance responsibility for each road within the Forest.

- 5.** The affect of county and private road management on water quality and aquatic resources must be considered.

There is a lack of local information in this area and it is difficult to access the impact of non-Forest Service road maintenance on water quality and aquatic resources. However it is known that there is a need to improve stream crossings by Forest, other federal, state, and local agency roads. Partnerships that pursue grants, agreements and technology transfer are encouraged to reduce the amount of sedimentation reaching streams and negative impacts to aquatic species. Monitoring and evaluation of road surface erosion and stream sedimentation

needs to be done. See Table 7.2 for a comparison of stream crossings by various agencies.

- 6.** Partner with other law enforcement agencies to reduce crimes with the National Forest. Road access must be maintained for law enforcement and emergency services response.

A thorough analysis of crimes and emergency calls was not completed for this analysis. However, the MTNF should maintain partnerships and improve relationships with other law enforcement agencies. Given the variety of crimes that are occurring on the Forest, any and all assistance would seem to be needed.

The survey of county commissioners offered some varying opinions, but largely elected officials believe that road access is necessary for effective law enforcement. There are some who believe that increased maintenance only increases the potential for illegal acts and emergency calls. Others believe that increased access discourages illegal acts. Any decisions to construct or decommission/close roads should certainly consider law enforcement and emergency service needs.

- 7.** Dumping of trash along roads is a concern. Partner with agencies addressing solid waste issues in an effort to reduce illegal dumping in the Forest.

Again, a thorough analysis of dumpsites on the forest was not conducted. However, the Ozark Rivers Solid Waste Management District plans to identify illegal dumpsites in the seven counties it serves, some of which include National Forest lands. It is recommended that Forest Service personnel partner with agencies addressing solid waste issues in an effort to reduce illegal dumping in the Forest. This would help identify existing local programs that may be helpful in documenting or addressing illegal dumping programs. The Ozark Rivers District promotes an illegal dumping hotline that works in cooperation with county sheriffs to identify illegal dumps and those who are doing the dumping. Other agencies are also trying to identify trash dump locations and then determine how to dispose of the trash. Forest protection officers, along with Forest law enforcement officers, are writing up incident reports about the locations of trash dumps too. A database is being used to store these incident locations. In addition, if the offenders are identified, fines and/or restitution may be assessed. Also, the Salem District ranger is trying to form an agreement with the Reynolds County Sheltered Workshop to assist with the removal of trash on the district. The MTNF needs to continue working with other agencies to alleviate this ever-growing problem.

8. Access for the public to National Forest systems lands is a key concern for recreational and other pursuits.

Partner with agencies addressing local, state and regional transportation needs. Provide a seamless transportation system between and amongst the various agencies.

As discussed earlier, segments of the public are increasingly concerned that access to public lands is being methodically closed off. Many have enjoyed access for generations, and believe they have an historical and proprietary right to enjoy and use those lands. Further, an aging and increasingly disabled “boomer” population is requesting motorized access for specific pursuits, such as hunting, and land managers are receiving more and more requests to accommodate disabled persons. Closing roads, for any project, is often the most controversial aspect of a NEPA decision and any notice to close roads is an invitation to significantly increase public involvement in a land management decision. County and local governments, attuned to their local constituents, quickly become interested in National Forest management whenever the discussion moves to road issues. While every effort should be made to maintain and protect the Forest, it may be necessary to make changes in rules and regulations to meet the needs of a changing population.

9. Illegal OHV use is an issue.

OHV operators have been and continue to use county and forest system roads to access non-system roads, unauthorized user-made trails and in some cases to travel across county. OHV use can also be found within state highway right-of-ways and utility corridors. This illegal OHV activity have resulted in surface erosion, soil compaction and stream degradation.

In addition to the two authorized trail systems on the MTNF, the Forest has also allowed permitted ATVs to be operated on open Forest system roads in those counties that have established an ATV permit system.

Allowing OHVs on open Forest system roads has increased the riding opportunities for OHVs on the MTNF. However, it has not eliminated the widespread illegal riding activities mentioned above. Forest law enforcement officers continue to fine OHV operators illegally using the Forest, but it only makes a dent in the problem. Misinformation about legal OHV opportunities on the Forest is a continuing problem as well. Some misinformation comes from Forest employees, but the majority comes from outside sources.

Increasing law enforcement patrols, issuance of fines, OHV riding group partnerships, and public education is an ongoing Forest need. The MTNF should seek additional methods for reducing the amount of illegal OHV activities across the Forest.

While it is not illegal for OHVs to operate on open Forest system and county roads where they are authorized by permit, the use should be monitored and evaluated in non-motorized management areas. Allowing such motorized recreation seems to conflict with Forest Plan direction. In addition, there is concern about the safety of OHV operators who share roads with larger highway and commercial vehicles.

10. Update the Forest Plan to reflect the changing needs of road management.

The Forest Plan needs to use the latest Forest Service terminology, classification system, handbooks and manuals to describe its current and desired transportation system. For example, the subcategory of “woods roads” has been difficult to manage. The transportation atlas should be a dynamic system based on the access needed for a variety of natural, social, and economic reasons. Current databases and management tools, such as INFRA and GIS should be used store, manage, and update data about the road system.

Density limits need to be reevaluated and substantiated. Current methods of determining road density are questionable. Actual density limits should be based on current environmental, social, and economic factors.

Monitoring and evaluation of road closure methods needs to be conducted. Determine which method(s) is most successful and cost effective. Prioritize the order in which non-system roads should be closed.

11. Determine the long-range plan of developed recreation areas.

The long-range plan of individual recreation areas needs to be determined, as this can affect the access needs of the area. It is likely that some recreation areas may need road improvements, while other just regular maintenance, and yet for some an elimination of roads due to social, economic, or environmental reasons. In addition, the continued vandalism of a recreation area can force Forest managers to permanently close an area. The ability of the Forest to manage a number of recreation areas across the Forest should be considered as well.

Report and Maps

This roads analysis resulted in the *Road Analysis Report* and accompanying maps that document the information and analysis methods used to identify social, economic and environmental opportunities, problems, risks and priorities for future road management. The *Road Analysis Report* documents the key findings of the analysis and contains graphical, tabular and geo-spatial displays of the transportation system options. It is important that the roads analysis identify access needs and opportunities that are based on current budget levels and realistic projections of future funding. Analysts located, interpreted and used

relevant scientific literature in the analysis and disclosed assumptions on which the analysis is based.

Maps developed in this analysis utilized current Forest GIS layers of the current inventoried road system, streams, lakes, range allotments, wilderness areas, mineral areas, developed recreation areas, land ownership using ALP, Ranger District boundaries, cities, and county boundaries.

The report and maps for the *Road Analysis Report* are contained in and may be accessed through the [website](#) of the Mark Twain National Forest.

Road Atlas

The transportation atlas for the Mark Twain National Forest consists of those maps incorporated into the Forest GIS road coverage, Forest Service Infrastructure (INFRA) Version 5.0.1 Travel Routes database, plans and associated information available as of January 12, 2001. The Forest Service will add to this information in accordance with direction in *Road Analysis: Informing Decisions About the National Forest Transportation System*, Miscellaneous Report FS-643, and other chapters of FSM 7700.

The Forest Service will maintain a current record of forest transportation facilities in the atlas. The ongoing real property and condition survey updates (FSM 6446) will be used as appropriate. INFRA will be used for the storage and analysis of information in the transportation atlas.

- The forest road atlas is a key component of the forest transportation atlas and, consistent with the road inventory, includes all classified and unclassified roads on National Forest System lands.
- The road atlas includes, at a minimum, the location, jurisdiction and road management objectives for classified roads and bridges and the location of unclassified roads and any management actions taken to change the status of unclassified roads.
- Data and other information contained in the road atlas should be used to support roads analysis.
- Forest transportation managers shall document changes in road management status, including changes such as accomplishment of decommissioning objectives or the addition of an unclassified road to the forest road system.
- Temporary roads are not intended to be included as part of the forest road atlas, as they are managed by the projects or activities under

which they are authorized and decommissioned at the conclusion of the authorized activity.

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Glossary

Assessment The act of estimating or determining the significance, importance or value of something.

Best Management Practices (BMPs) Methods, measures and practices selected by an agency to meet its needs to control non-point water pollution sources. BMP's include, but are not limited to, structural and nonstructural controls, and operation and maintenance procedures. BMPs can be applied before, during and after activities to reduce or eliminate water pollution caused by these activities.

Biota The animal and plant life of a region.

Classified Road Roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long term motor vehicle access, including state roads, county roads, privately owned roads, National Forest System roads and other roads authorized by the Forest Service.

Endangered In danger of becoming extinct.

Fauna The animals of a specified region or time.

Floodplain A lowland area adjoining a watercourse.

Ground water Generally, all subsurface water (as distinct from surface water); specifically, that part of the subsurface water in a saturated zone (a zone in which all voids are filled with water) where the water is under pressure greater than atmospheric.

Hydrology The science dealing with the study of water on the surface of the land, in soil and underlying rock, and in the atmosphere.

Intermittent stream One that has intervals of flow interspersed with intervals of no flow. A stream that ceases to flow for a time.

Karst topography An area of limestone formations marked by sinkholes, caves, springs and underground streams.

Land use Particular function to which a region of land is being used, such as agriculture or forest.

Missouri Department of Conservation (MDC) Missouri agency charged with: protecting and managing the fish, forest, and wildlife resources of the state; serving the public and facilitating their participation in resource management activities; and providing opportunity for all citizens to use, enjoy and learn about fish, forest and wildlife resources.

Missouri Department of Natural Resources (MDNR) Missouri agency charged with preserving and protecting the state's natural, cultural and energy resources and inspiring their enjoyment and responsible use for present and future generations.

Missouri Department of Transportation (MoDOT) Missouri agency responsible for the design, improvement, operation and maintenance of the state's transportation modes.

National Forest System Road A classified forest road under the jurisdiction of the Forest Service. The term "National Forest System Road" is synonymous with the term "forest development road (FDR)" as used in 23 U.S.C. 205.

Native species Species that is within its known historical range and for which there has been no evidence of humans having introduced it.

New Road Construction Activity that results in the addition of Forest classified or temporary road miles (36 CFR 212.1).

Organic Of or pertaining to living things; compounds containing carbon that also have either carbon-carbon or carbon-hydrogen bonds.

Perennial streams Streams fed continuously by a shallow water table and flowing year-round.

Point source Source of pollution that involves discharge of wastes from an identifiable point, such as a smokestack or sewage treatment plant.

Pollutant Something that causes something else to be unclean, contaminated or impaired.

Potential erosion Soil erosion that is determined by a mathematical formula designed to estimate the amount of actual erosion that is possible from an area of land characterized by a predominant land use.

Private Road A road under private ownership authorized by an easement to a private party, or a road that provides access pursuant to a reserved or private right.

Public Road Any road or street under the jurisdiction of and maintained by a public authority and open to public travel (23 U.S.C. 101[a].)

Riparian Pertaining to, situated or dwelling on the margin of a river or other body of water.

Road A motor vehicle travelway over 50 inches wide, unless designated and managed as a trail. A road may be classified, unclassified or temporary.

Road Decommissioning Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1, FSM 7703)

Road Maintenance The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective (FSM 7712.3).

Road Maintenance Levels Traffic service standards to which National Forest system roads are maintained. There are five defined maintenance levels which correspond to a desired level of service:

- **Level 1** Basic custodial care (closed).
- **Level 2** High clearance vehicles.
- **Level 3** Suitable for passenger cars.
- **Level 4** Moderate degree of user comfort.
- **Level 5** High degree of user comfort.

Sediment Material created by mechanical or chemical erosion and deposited by water, wind or glaciers.

Sensitive species A term used for species of special concern by some states and the National Forest System.

Silviculture The science and practice of controlling forest establishment, growth, composition and structure.

Substrate The mineral and/or organic material forming the bottom of a waterway or water body.

Suspended sediment Material that would usually sink to the bottom of a liquid that has been mixed with, but not dissolved, in a liquid.

Temporary Road A road authorized by contract, permit, lease, or other written authorization, or emergency operation, not intended to be a part of the Forest transportation system and not necessary for long-term resource management.

Threatened A species likely to become endangered within the foreseeable future if certain conditions continue to deteriorate.

Unclassified Road A road on National Forest System lands that is not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways and off-road vehicle tracks that have not been designated and managed

as a trail, and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization.

United States Geological Survey (USGS) Federal agency charged with providing reliable information to: describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect the quality of life.

Water quality Information about the chemical, physical and biological characteristics, overall usefulness, and varieties of streams, lakes and groundwater.

Watershed The total land area that water runs over or under when draining to a stream, river, pond or lake.

Wetlands Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions.

Woods Road This is a special designation used on the Mark Twain National Forest to identify the lowest standard road on the Forest Development System. It is defined as an unimproved road retained on the permanent road system and usually open to the public. Maintenance is minimal, but resource protection is required.

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APPENDIX 1: DEMOGRAPHICS

Table 7.1: Demographics for Counties Containing Mark Twain National Forest

Counties w/NF Lands	Total Population	Median Age	% White	% Pop Change 1999-2000	% Pop Over 65	% Below Poverty Rate†	% Children in Poverty††	Median Household Income	Persons Per Sq. Miles	% Seasonal Housing	2001 Unemployment Rate*
Phelps	39,825	34.9	93.2	13.0	13.9	15.5	22.1	\$29,529	59.2	1.7	3.5
Pulaski	41,165	28.5	78.4	-0.3	7.9	14.3	16.6	\$31,701	75.3	3.1	6.3
Laclede	32,513	36.6	97.0	19.7	14.1	15.0	21.7	\$28,136	42.4	1.9	6.5
Wright	17,955	37.7	97.6	7.1	16.5	20.5	27.1	\$22,330	26.3	1.0	9.3
Texas	23,003	40.4	96.5	7.1	17.8	20.7	28.8	\$22,773	19.5	2.7	7.1
Boone	135,454	29.5	85.4	20.5	8.6	11.4	14.3	\$38,421	197.7	0.4	1.8
Callaway	40,766	34.7	91.8	24.3	11.0	10.6	14.7	\$35,105	48.6	2.3	3.5
Barry	34,010	38.2	94.1	23.5	16.1	15.5	24.1	\$26,543	43.7	8.2	4.6
Stone	28,658	44.1	97.6	50.2	18.9	13.1	23.0	\$28,623	61.9	17.7	9.9
Taney	39,703	38.8	96.2	55.3	16.2	13.1	22.2	\$27,001	62.8	8.9	7.9
Christian	54,285	34.5	97.3	66.3	10.6	9.1	13.8	\$36,236	96.4	0.7	3.9
Ozark	9,542	43.6	97.6	11.0	19.5	21.2	33.3	\$21,345	12.9	10.3	5.9
Douglas	13,084	40.1	96.9	10.2	17.1	21.5	30.8	\$21,955	16.1	2.4	10.1
Howell	37,238	38.2	96.4	18.4	16.8	19.6	28.6	\$23,423	40.1	0.7	4.8
Oregon	10,344	41.0	94.6	9.2	18.0	23.8	34.6	\$19,847	13.1	3.2	4.4
Shannon	8,324	38.8	95.1	9.3	15.0	25.4	37.0	\$19,753	8.3	4.4	6.6
Carter	5,941	38.9	96.6	7.7	15.9	24.8	36.3	\$20,808	11.7	9.2	6.5
Ripley	13,509	39.4	97.2	9.8	17.3	26.0	36.6	\$19,671	21.5	5.6	7.4
Butler	40,867	38.7	92.2	5.4	16.7	20.0	29.0	\$24,073	58.5	1.7	6.0
Wayne	13,259	42.5	97.7	14.9	19.8	25.4	37.9	\$18,786	17.4	12.4	11.6
Madison	11,800	39.1	98.3	6.0	18.0	17.7	25.1	\$24,462	23.7	7.0	8.3
Iron	10,697	39.7	96.7	-3.0	17.1	20.8	30.2	\$23,782	19.4	4.7	8.0
Bolliger	12,029	37.9	97.8	13.3	14.8	16.4	23.0	\$26,068	19.4	6.6	7.2
St. Francois	55,041	37.2	96.1	13.8	14.9	16.3	23.0	\$28,589	123.9	7.5	7.3
St. Genevieve	17,842	37.7	98.0	11.3	14.5	9.4	12.8	\$37,170	35.5	12.1	5.2
Dent	14,927	39.6	97.1	8.9	17.7	19.5	27.0	\$24,695	19.8	4.2	8.8
Crawford	22,804	37.9	98.3	18.9	15.8	15.8	23.3	\$27,143	30.7	9.6	6.4
Washington	23,344	35.2	95.5	14.5	11.7	23.5	30.4	\$24,649	30.7	5.6	8.7
TOTAL	807,929										
Mark Twain Average	28,855	38.0	95.0	18.0	15.0	15.0	26.0	\$26,165	44.0	6.0	6.7
Missouri Average	48,235	36.1	84.9	0.6	13.5	12.2	17.7	\$37,934	81.2	4.9	4.7

Source: Census 2000, www.census.gov or <http://www.oseda.missouri.edu/mscdc/index.html>

*Source: Missouri Works Labor Market Information website, moworks.state.mo.us/lmi/owa/adb.area1

†Source: Estimate of Number and Percentage of People of All Ages in Poverty by County, MO 1997, http://www.census.gov/hhes/saie/stcty/997_29.htm

††Source: U.S. Census Bureau, Small Area Poverty and Estimates Program, <http://oseda.missouri.edu/step>, Jan. 2001

APPENDIX 2: STREAM CROSSINGS

Table 7.2 Number of Stream Crossings by Ranger District

Congressionally Designated Boundary	Stream/ County Road	Stream/ State Road	Stream/ FS Level 3, 4 & 5 Roads
Ava	251	69	3
Cassville	152	48	0
Cedar Creek	103	28	2
Doniphan/Eleven Point	431	93	5
Fredericktown	208	92	4
Houston	331	92	15
Poplar Bluff	310	153	2
Salem	677	191	29
Willow Springs	168	51	3
TOTAL	2631	817	63
Source: GIS Analysis by MRPC, Jan. 2003			

There are a total of 3,511 stream crossings on the Mark Twain National Forest, according to an analysis of MTNF GIS information. Seventy-percent of all stream crossings (2,631) on the Mark Twain National Forest occur on county roads. An additional 23 percent (817) are located on state roads while 2 percent (63) are actually on Forest Service roads.

More than a quarter of all crossings (26 percent) occur on the Salem-Potosi District; 897 total stream crossings are located on the Salem-Potosi District. Some 46 percent of all Forest Service road and stream crossings occur on the Salem-Potosi District as well. Of the 63 stream crossings on Forest Service roads, 29 occur on the Salem-Potosi District.

The two stream/FS level 3, 4 & 5 roads crossings listed for Cedar Creek are incorrect (See map 4-3). The location of Forest Roads 1671 and 1681 are incorrect in the November 2002 GIS data. The actual location of the roads is such that they don't cross any perennial stream.

APPENDIX 3: ESTIMATED RUNOFF AND SEDIMENT PRODUCTION FROM ROADS

The following analysis simulates the effects of 10 years of weather and use upon representative forest roads in the area of Salem, Missouri. This analysis utilizes the Water Erosion Prediction Process (WEPP) Forest Road Erosion Predictor model.

The WEPP model ([Flanagan and Livingston 1995](#)) is a physically-based soil erosion model that can provide estimates of soil erosion and sediment yield considering the specific soil, climate, ground cover, and topographic conditions. It was developed by an interagency group of scientists including the U.S. Department of Agriculture's Agricultural Research Service (ARS), Forest Service, and Natural Resources Conservation Service; and the U.S. Department of Interior's Bureau of Land Management and Geological Survey.

WEPP simulates the conditions that impact erosion--such as the amount of vegetation canopy, the surface residue, and the soil water content for every day in a multiple-year run. For each day that has a precipitation event, WEPP determines whether the event is rain or snow, and calculates the infiltration and runoff. If there is runoff, WEPP routes the runoff over the surface, calculating erosion or deposition rates for at least 100 points on the hillslope. It then calculates the average sediment yield from the hillslope.

WEPP Forest Road Erosion Predictor is an interface to the Water Erosion Prediction Project (WEPP) soil erosion model that allows users to easily describe numerous road erosion conditions. The interface presents the results as a summary and extended WEPP output, and has an optional log to store the results from a series of runs. WEPP Forest Road Erosion Predictor is linked to the Rock:Clime climate generator with a database from more than 2600 weather stations.

Because WEPP Forest Road Erosion Predictor is process-based, it can be applied to any condition where the necessary input data are known. WEPP is difficult to apply, however, because of the amount of input data required. To simplify the application of WEPP to forest roads anywhere in the U.S., a custom interface was developed for the road/buffer template described by presented below. Users can select any climate they desire from a climate database. Soil properties are based on research findings. The road is assumed to be free of vegetation, the fill slope to be covered with sufficient vegetation to give about 50 percent ground cover, and the buffer surface covered with litter from a 20-year old forest, generally 100 percent. Five weather stations near various Mark Twain National Forest District locations were used for modeling erosion and sediment levels for three different road types and for both aggregate and paved surfaces. In the iteration of the WEPP model used for this analysis, the paved results are still under review.

The following tables represent predicted road prism erosion and sediment leaving a buffer for a low-gradient, aggregate surfaced National Forest system road segment on a ridge top landscape position. There is at least a 100-foot vegetation buffer between the

road surface and adjacent intermittent streams. The first column refers to aggregate surfaces and the second column refers to asphalt surfaces.

WEPP: Road Analysis Results No.1					
			Gradient (%)	Length (ft)	Width (ft)
Various road designs		Road	4	200	13
Silt loam		Fill	15	15	
Aggregate and paved surface		Buffer	5	100	

10-Year Mean Annual Averages (Salem, MO Weather Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	2913	324	3832	422
Insloped with vegetated or rock ditch	1608	283	1746	303
Outsloped, rutted	2691	314	736	123
Outsloped, unrutted	1707	0	295	0

10-Year Mean Annual Averages (Doniphan, MO Weather Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	4055	704	5057	782
Insloped with vegetated or rock ditch	2261	609	2819	571
Outsloped, rutted	3734	673	1241	237
Outsloped, unrutted	2135	110	627	70

10-Year Mean Annual Averages (Rolla (School of Mines), MO Weather Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	3190	394	4082	497
Insloped with vegetated or rock ditch	1830	353	2014	366
Outsloped, rutted	2920	386	920	143
Outsloped, unrutted	1827	0	380	10

10-Year Mean Annual Averages (Springfield, MO Climate Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	2853	347	3790	395
Insloped with vegetated or rock ditch	1588	314	1806	286
Outsloped, rutted	2723	342	808	114
Outsloped, unrutted	1654	6	415	16

10-Year Mean Annual Averages (Arcadia, MO Climate Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	3641	657	4180	759
Insloped with vegetated or rock ditch	2107	571	2037	565
Outsloped, rutted	3442	637	834	230
Outsloped, unrutted	2126	50	610	60

10-Year Mean Annual Averages (Jefferson City, MO Climate Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	2800	240	3823	306
Insloped with vegetated or rock ditch	1658	222	1947	247
Outsloped, rutted	2658	230	877	105
Outsloped, unrutted	1598	0	362	0

The following tables represent predicted road prism erosion and sediment leaving the buffer of a low-gradient, aggregate surfaced National Forest system road segment on a side-slope landscape position. There is at least a 100-foot vegetation buffer between the road surface and adjacent intermittent streams.

WEPP: Road Analysis Results					
			Gradient (%)	Length (ft)	Width (ft)
Various road designs		Road	4	200	13
Silt loam		Fill	50	15	
Aggregate and paved surface		Buffer	15	100	

10-Year Mean Annual Averages (Salem, MO Climate Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	3832	861	6220	1094
Insloped with vegetated or rock ditch	2514	734	4164	845
Outsloped, rutted	3415	803	2186	412
Outsloped, unrutted	1724	110	1066	104

10-Year Mean Annual Averages (Doniphan, MO Climate Station)

Road Design	Aggregate (road prism	Aggregate (sediment leaving a buffer	Asphalt (road prism surface	Asphalt (sediment leaving a
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	surface erosion in pounds)	in pounds)	erosion in pounds)	buffer in pounds)
Insloped, bare ditch	5272	1621	8582	1997
Insloped with vegetated or rock ditch	3594	1354	6394	1586
Outsloped, rutted	4566	1474	3370	836
Outsloped, unrutted	2220	426	1850	452

10-Year Mean Annual Averages (Rolla (School of Mines), MO Climate Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	4256	1133	6660	1253
Insloped with vegetated or rock ditch	2878	953	4607	967
Outsloped, rutted	3703	1032	2409	478
Outsloped, unrutted	1866	66	1311	126

10-Year Mean Annual Averages (Springfield, MO Climate Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	3779	835	6443	1107
Insloped with vegetated or rock ditch	2493	721	4422	862
Outsloped, rutted	3374	764	2232	404
Outsloped, unrutted	1683	202	1271	211

10-Year Mean Annual Averages (Arcadia, MO Climate Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	4791	1698	6728	1960
Insloped with vegetated or rock ditch	3203	1409	4636	1537
Outsloped, rutted	4110	1491	2294	767
Outsloped, unrutted	2184	238	1731	221

10-Year Mean Annual Averages (Jefferson City, MO Climate Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	3933	701	6398	912
Insloped with vegetated or rock ditch	2707	627	4566	764
Outsloped, rutted	3356	615	2406	407
Outsloped, unrutted	1625	11	1246	105

The following tables represent predicted road prism erosion and sediment leaving a buffer for a typical high-gradient, aggregate and paved surface National Forest System road on a side-slope landscape position. There is at least a 100-foot length buffer between the road surface and adjacent intermittent streams.

WEPP: Road Analysis Results					
			Gradient (%)	Length (ft)	Width (ft)
Various road designs		Road	8	200	13
Silt loam		Fill	50	15	
Aggregate and paved surfaces		Buffer	25	100	

10-Year Mean Annual Averages (Salem, MO Climate Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	5438	1811	9444	2209
Insloped with vegetated or rock ditch	3553	1538	5691	1812
Outsloped, rutted	4953	1678	2220	650
Outsloped, unrutted	2486	473	1176	151

10-Year Mean Annual Averages (Doniphan, MO Climate Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	7053	3180	12497	3918
Insloped with vegetated or rock ditch	4906	2692	8320	3180
Outsloped, rutted	6394	2925	3472	1246
Outsloped, unrutted	3156	942	1834	449

10-Year Mean Annual Averages (Rolla (School of Mines), MO Climate Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	5851	2054	9770	2512
Insloped with vegetated or rock ditch	3957	1751	6151	2066
Outsloped, rutted	5376	1910	2440	750
Outsloped, unrutted	2670	419	1388	153

10-Year Mean Annual Averages (Springfield, MO Climate Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	5417	1780	9390	2237
Insloped with vegetated or rock ditch	3507	1504	5642	1882
Outsloped, rutted	4909	1620	2228	738
Outsloped, unrutted	2424	470	1344	265

10-Year Mean Annual Averages (Arcadia, MO Climate Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	6501	3019	10,107	3682
Insloped with vegetated or rock ditch	4406	2570	6309	3000
Outsloped, rutted	5606	2739	2353	1127
Outsloped, unrutted	3101	860	1517	358

10-Year Mean Annual Average (Jefferson City, MO Climate Station)

Road Design	Aggregate (road prism surface erosion in pounds)	Aggregate (sediment leaving a buffer in pounds)	Asphalt (road prism surface erosion in pounds)	Asphalt (sediment leaving a buffer in pounds)
Insloped, bare ditch	5305	1573	9220	1901
Insloped with vegetated or rock ditch	3657	1394	6028	1618
Outsloped, rutted	4778	1428	2490	662
Outsloped, unrutted	2305	358	1370	207

APPENDIX 4:
INFORMATION TABLE ON MAINTENANCE LEVEL 3 & 4 ROADS

Table 7.3: Information Table on Maintenance Level 3 & 4 Roads

Road #	Road Name	Unit	Length (Miles)	Surface	Maint. Level	Functional Class	Comments
108	Noblett	Willow Springs	5.60	Aggregate	3	Collector	Bladed annually
117	Willow Springs Admin Site	Willow Springs	0.10	Asphalt	4	Local	Administrative site will be vacated by FS in May, 2006.
121	Blue Buck Tower	Willow Springs	0.50	Aggregate	3	Local	Bladed annually. Active tower.
121A	Blue Buck Tower Spur A	Willow Springs	0.15	Aggregate	3	Local	Continue regular maintenance
122	Overlook	Willow Springs	0.85	Aggregate	3	Local	Bladed annually
145	Pond Fork	Ava	2.50	Aggregate	3	Collector	Bladed annually. Stream crossing.
147	Glade Top Trail	Ava	17.00	Aggregate	3	Collector	Bladed annually. National Forest Scenic Byway. Nominated PFSR.
149	Sky Line Drive	Ava	5.70	Aggregate	3	Collector	Bladed annually. Nominated PFSR.
150	McAdoo	Ava	7.40	Aggregate	3	Collector	Bladed annually. Candidate for county road easement.
154	Hercules Tower	Ava	0.40	Aggregate	3	Local	Bladed annually. Active tower.
160	Ava Admin Site	Ava	0.20	Asphalt	4	Local	Expand parking capacity
187	Piney Ridge	Cassville	4.20	Aggregate	3	Collector	Bladed annually
189	Carr Low Gap	Cassville	0.80	Aggregate	3	Local	Bladed annually
197	Sugar Camp	Cassville	8.20	Aggregate	3	Collector	Bladed annually. National Forest Scenic Byway. Nominated PFSR.
199	Cassville Admin Site	Cassville	1.20	Asphalt	4	Local	Expand parking capacity
204	Cavaness Vista	Houston	0.10	Aggregate	3	Local	Continue regular maintenance
211	Paddy Creek Rec Area	Houston	0.80	Asphalt	4	Local	Continue regular maintenance
227	Houston Admin Site	Houston	0.20	Asphalt	4	Local	Continue regular maintenance
240	Bald Ridge	Rolla	2.00	Aggregate	3	Arterial	Bladed annually
241	Roby Tower	Houston	0.20	Aggregate	3	Local	Continue regular maintenance. Active tower.
272	Fairview Tower	Rolla	0.10	Aggregate	3	Local	Continue regular maintenance. Active tower.
274	Roby Lake Rec Area	Houston	0.70	Aggregate	3	Local	Bladed annually. Stream crossing.
311	MTNF Supervisors Office	Rolla	0.30	Asphalt	4	Local	Continue regular maintenance
342	Elliot	Rolla	1.70	Aggregate	3	Local	Bladed annually

424	Middle Ridge	Willow Springs	3.00	Aggregate	3	Collector	Continue regular maintenance. Stream crossing.
426	Indian Narrows	Willow Springs	3.50	Aggregate	3	Local	Continue regular maintenance. Stream crossing.
533	Bar K	Ava	0.90	Aggregate	3	Local	Bladed annually
533A	Bar K Spur A	Ava	0.80	Aggregate	3	Local	Continue regular maintenance. Stream crossings.
559	Cobb Ridge Rec Area	Ava	2.10	Asphalt	4	Local	Continue regular maintenance
570	Camp Ridge	Ava	0.20	Asphalt	4	Local	Continue regular maintenance
744	Dark Bottom	Willow Springs	1.05	Aggregate	3	Local	Candidate for county road easement
805	North Fork Rec Area	Willow Springs	1.10	Asphalt	4	Local	Continue regular maintenance
857	Noblett Lake Rec Area	Willow Springs	3.30	Asphalt	4	Local	Continue regular maintenance
1083	Big Bay Rec Area	Cassville	2.10	Asphalt	4	Local	Continue regular maintenance
1260	Shell Knob Rec Area	Cassville	0.50	Asphalt	4	Local	Continue regular maintenance
1502	Big Piney Trail Camp	Houston	0.20	Aggregate	3	Local	Add to annual blading contract. Stream crossing.
1502A	Big Piney Trail Camp Spur A	Houston	0.10	Aggregate	3	Local	Add to annual blading contract
1508	Baldrige School	Houston	3.90	Aggregate	3	Collector	Bladed annually
1516	Schott	Rolla	3.10	Aggregate	3	Collector	Bladed annually
1576	Kaintuck Hollow	Rolla	4.20	Aggregate	3	Arterial	Bladed annually. Mill Creek Bridge. Nominated PFSR. Stream crossings.
1593	Kaintuck Cemetary	Rolla	0.20	Aggregate	3	Local	Bladed annually
1671	Dry Fork	Cedar Creek	0.40	Aggregate	3	Local	Add to annual blading contract
1681	Carrington Pits Rec Area	Cedar Creek	0.70	Aggregate	3	Local	Add to annual blading contract
1682	Pine Ridge Rec Area	Cedar Creek	0.20	Asphalt	4	Local	Continue regular maintenance
1727	Railhead	Rolla	2.10	Aggregate	3	Collector	Bladed annually
1730	Booker Bend	Rolla	4.90	Aggregate	3	Collector	Bladed annually. Stream crossings.
1892	Lanes Spring Rec Area	Rolla	3.10	Asphalt	4	Local	Continue regular maintenance
2011	Red Bluff Rec Area	Potosi	2.10	Asphalt	4	Local	Lower loop in close proximity to creek and experiences frequent flooding. Creek bank sloughing.
2117	Crane Lake Parking & Boat Ramp	Fredericktown	0.10	Aggregate	3	Local	Continue regular maintenance
2120	Marsh Creek	Fredericktown	10.10	Aggregate	3	Collector	Bladed annually. Stream crossing.
2193	Loggers Lake Rec Area	Salem	1.20	Asphalt	4	Local	Continue regular maintenance. Stream crossing.
2193	Loggers Lake Rec Area	Salem	0.30	Aggregate	3	Local	Bladed annually
2196	Fredericktown Admin Site	Fredericktown	0.30	Asphalt	4	Local	Continue regular maintenance

2199	Bidwell	Fredericktown	11.10	Aggregate	3	Arterial	Bladed annually. Shared cooperative road maintenance with county for 2.6 miles. Stream crossings.
2221	Bunker	Salem	8.50	Aggregate	3	Collector	Bladed annually. Candidate for county road easement. Stream crossing.
2228	Shepard Cutoff	Potosi	5.50	Aggregate	3	Arterial	Bladed annually
2231	Buick Truck Trail	Potosi	8.10	Aggregate	3	Collector	Bladed annually
2234	Marcoot Tower	Salem	0.10	Aggregate	3	Local	Continue regular maintenance. Active tower.
2240	Salem Admin Site	Salem	0.30	Asphalt	4	Local	Continue regular maintenance
2241	Buick Tower	Potosi	0.10	Aggregate	3	Local	Continue regular maintenance. Active tower.
2252	Czar Tower	Potosi	0.10	Aggregate	3	Local	Continue regular maintenance. Active tower.
2257	Crooked Tower	Salem	6.80	Aggregate	3	Arterial	Bladed annually
2258	Potosi Admin Site	Potosi	0.30	Asphalt	4	Local	Expand parking capacity
2265	Floyd Butts	Potosi	4.00	Aggregate	3	Arterial	Bladed annually. Candidate for county road easement. Lower water crossing installed recently.
2268	Thunder Valley	Potosi	2.90	Aggregate	3	Local	Add to annual blading contract
2275	Berryman Rec Area	Potosi	0.30	Asphalt	4	Local	Continue regular maintenance
2293	Floyd Tower	Potosi	0.10	Aggregate	3	Local	Continue regular maintenance. Active tower.
2301	Mash Creek	Salem	2.60	Aggregate	3	Local	Bladed annually
2306	Tower South	Salem	3.70	Aggregate	3	Collector	Bladed annually
2307	Bunker Ranch Road	Salem	4.40	Aggregate	3	Collector	Bladed annually
2314	Hwy P Trailhead	Salem	0.10	Aggregate	3	Local	Continue regular maintenance
2340	Scotia Dam Road	Salem	0.30	Aggregate	3	Local	Bladed annually
2341	Little Scotia Pond Rec Area	Salem	1.40	Aggregate	3	Local	Bladed annually. Stream crossing.
2346	Huzzah Fisherman Parking	Salem	0.10	Aggregate	3	Local	Continue regular maintenance
2349	Warren Valley	Salem	3.90	Aggregate	3	Collector	Bladed annually. Stream crossing.
2358	Twin Ponds	Salem	0.10	Aggregate	3	Local	Continue regular maintenance
2359	Lindsey Mountain	Potosi	1.90	Aggregate	3	Local	Bladed annually
2360	Twin Ponds Parking Lot	Salem	0.10	Aggregate	3	Local	Continue regular maintenance
2362	Triple Ponds Parking Lot	Salem	0.10	Aggregate	3	Local	Continue regular maintenance
2363	Peter Cave Hollow	Potosi	6.60	Aggregate	3	Collector	Bladed annually
2391	Cub Creek	Potosi	6.80	Aggregate	3	Collector	Bladed annually
2392	Hazel Creek Rec Area	Potosi	0.40	Aggregate	3	Local	Bladed annually
2423	Old Tiff Mill	Potosi	2.10	Aggregate	3	Collector	Bladed annually
2438	Flatwoods	Potosi	4.80	Aggregate	3	Collector	Bladed annually
2454	Hickory Grove Church	Potosi	2.80	Aggregate	3	Collector	Continue regular maintenance
2505	Brazil Creek Rec Area	Potosi	0.20	Aggregate	3	Local	Continue regular maintenance

2510	Silver Mines Rec Area	Fredericktown	1.00	Asphalt	4	Local	Continue regular maintenance. Stream crossing.
2510A	Silver Mines Rec Area Spur A	Fredericktown	0.50	Asphalt	4	Local	Continue regular maintenance
2510B	Silver Mines Rec Area Spur B	Fredericktown	0.30	Asphalt	4	Local	Continue regular maintenance
2510C	Silver Mines Rec Area Spur C	Fredericktown	0.40	Asphalt	4	Local	Continue regular maintenance
2518	Whitewater Parking	Fredericktown	0.20	Asphalt	4	Local	Continue regular maintenance
2519	Riverside	Fredericktown	0.20	Asphalt	4	Local	Continue regular maintenance
2519A	Riverside Parking	Fredericktown	0.10	Asphalt	4	Local	Continue regular maintenance
2520	Marble Creek Rec Area	Fredericktown	1.50	Asphalt	4	Local	Continue regular maintenance
2525	Sutton Bluff Rec Area	Salem	0.50	Asphalt	4	Local	Continue regular maintenance
2648	Sutton Bluff Trailhead	Salem	0.10	Aggregate	3	Local	Continue regular maintenance
2695	Palmer North	Potosi	2.50	Aggregate	3	Arterial	Bladed annually. Stream crossings
2768	Enough Boat Access	Potosi	0.30	Aggregate	3	Local	Continue regular maintenance
2774	Hwy A Trailhead	Potosi	0.10	Aggregate	3	Local	Continue regular maintenance
2776	Bell Mtn Wilderness Trailhead	Potosi	0.10	Aggregate	3	Local	Continue regular maintenance
2865	Sinking Shannon	Salem	1.30	Aggregate	3	Collector	Bladed annually
2997	Markham Springs Rec Area	Poplar Bluff	1.80	Asphalt	4	Local	Asphalt surface in poor condition. Determine long-term plan for recreation area. Stream crossing.
3001	Chapel Hill	Potosi	2.30	Asphalt	4	Local	Continue regular maintenance. Stream crossing.
3001A	Chapel Hill Spur A	Potosi	0.70	Asphalt	4	Local	Continue regular maintenance
3002	Wild Boar	Potosi	3.20	Asphalt	4	Local	Continue regular maintenance. Stream crossing.
3003	Lagoon Road	Potosi	0.50	Aggregate	3	Local	Continue regular maintenance. Stream crossing.
3100	Poplar Bluff Admin Site	Poplar Bluff	0.20	Asphalt	4	Local	Continue regular maintenance
3107	Wolf Creek	Poplar Bluff	2.20	Aggregate	3	Collector	Bladed annually. Stream crossing.
3110	Pine Cone	Poplar Bluff	2.30	Aggregate	3	Collector	Bladed annually
3112	Cane Ridge	Poplar Bluff	3.50	Aggregate	3	Collector	Bladed annually
3140	Bay Nothing	Doniphan	4.90	Aggregate	3	Collector	Add to annual blading contract. Stream crossing.
3142	Handy	Doniphan	6.10	Aggregate	3	Arterial	Bladed annually. Candidate for county road easement. Stream crossing.
3143	Few's Hill	Doniphan	4.40	Aggregate	3	Collector	Bladed annually.
3144	Compton	Doniphan	4.40	Aggregate	3	Collector	Bladed annually. Stream crossing.

3145	Turkey Knob	Doniphan	14.50	Aggregate	3	Arterial	Bladed annually. Stream crossings.
3148	Pine Bennett	Doniphan	5.70	Aggregate	3	Collector	Bladed annually. Stream crossing.
3150	Camp Four	Eleven Point	4.70	Aggregate	3	Collector	Bladed annually. Candidate for county road easement.
3152	Sisco	Doniphan	11.50	Aggregate	3	Arterial	Bladed annually. Candidate for county road easement. Stream crossing.
3155	McCormack Lake	Eleven Point	3.00	Asphalt	4	Local	Continue regular maintenance. Stream crossing.
3156	Camp 5 Pond	Doniphan	0.20	Aggregate	3	Local	Continue regular maintenance
3157	Doniphan Admin Site	Doniphan	0.30	Asphalt	4	Local	Need adequate parking capacity at new admin site
3159	Winona Admin Site	Eleven Point	0.30	Asphalt	4	Local	Continue regular maintenance
3167	Low Wassie	Eleven Point	4.60	Aggregate	3	Collector	Bladed annually. Stream crossing.
3169	Old Tram	Eleven Point	7.70	Aggregate	3	Collector	Bladed annually.
3170	New Liberty	Eleven Point	7.60	Aggregate	3	Collector	Bladed annually. Candidate for county road easement. Stream crossings.
3172	Possum Trot	Eleven Point	2.40	Aggregate	3	Arterial	Bladed annually.
3173	Banner Road	Eleven Point	7.50	Aggregate	3	Collector	Bladed annually. Candidate for county road easement. Stream crossings.
3174	High Tower	Eleven Point	11.00	Aggregate	3	Collector	Bladed annually. Candidate for county road easement. Stream crossings.
3179	Fisher Pond	Eleven Point	2.60	Aggregate	3	Collector	Bladed annually. Stream crossing.
3188	Greer Rec Area	Eleven Point	0.70	Asphalt	4	Local	Continue regular maintenance
3189	Cane Bluff	Eleven Point	0.60	Aggregate	3	Local	Continue regular maintenance. Candidate for county road easement.
3190	Turner Mill North	Eleven Point	2.70	Aggregate	3	Local	Bladed annually. Candidate for county road easement.
3210	Float Camp	Doniphan	1.00	Asphalt	4	Local	Continue regular maintenance. Stream crossing.
3213	Wolf Mountain	Doniphan	5.80	Aggregate	3	Arterial	Bladed annually. Stream crossings.
3220	Current River Camp	Doniphan	0.60	Asphalt	4	Local	Continue regular maintenance
3222	McFarland Pond	Doniphan	3.00	Aggregate	3	Collector	Bladed annually.
3224	Section 6	Doniphan	4.70	Aggregate	3	Collector	Bladed annually. Candidate for county road easement.
3225	Milt Road	Doniphan	2.50	Aggregate	3	Collector	Bladed annually.
3240	Ripley Lake	Doniphan	1.20	Aggregate	3	Local	Bladed annually.
3248	Riverton West	Eleven Point	0.20	Asphalt	4	Local	Continue regular maintenance
3249	142 Access	Eleven Point	0.20	Asphalt	4	Local	Continue regular maintenance
3270	Fremont Tower	Eleven Point	0.20	Asphalt	4	Local	Continue regular maintenance. Active tower.
3284	Thomasville Access	Eleven Point	0.50	Aggregate	3	Local	Continue regular maintenance
3285	Riverton East	Eleven Point	0.50	Asphalt	4	Local	Continue regular maintenance
3412	Gooseneck	Doniphan	6.40	Aggregate	3	Collector	Bladed annually. Stream crossings.

3549	Cave Eddy	Houston	0.30	Aggregate	3	Local	Bladed annually
3551	Tram	Poplar Bluff	0.40	Aggregate	3	Local	Add to annual blading contract. Candidate for county road easement.
3766	Pinewood Rec Area	Poplar Bluff	1.10	Asphalt	4	Local	Continue regular maintenance
3899	Beaver Lake	Poplar Bluff	0.40	Aggregate	3	Local	Bladed annually
3901	Bunker AA (Sinkin)	Salem	3.50	Aggregate	3	Collector	Bladed annually
3902	Bunker AB (Sinkin)	Salem	2.20	Aggregate	3	Local	Bladed annually
3903	Bunker AC (Sinkin)	Salem	2.20	Aggregate	3	Local	Bladed annually. Stream crossings.
3904	Bunker AD (Sinkin)	Salem	0.40	Aggregate	3	Local	Continue regular maintenance
3906	Bunker AF (Sinkin)	Salem	1.30	Aggregate	3	Local	Bladed annually. Stream crossing
3907	Bunker AG (Sinkin)	Salem	0.50	Aggregate	3	Local	Continue regular maintenance
3908	Bunker AH (Sinkin)	Salem	0.50	Aggregate	3	Local	Continue regular maintenance
3909	Bunker AI (Sinkin)	Salem	0.90	Aggregate	3	Local	Continue regular maintenance
3911	Bunker AK (Sinkin)	Salem	0.50	Aggregate	3	Local	Continue regular maintenance
3912	Bunker AL (Sinkin)	Salem	0.50	Aggregate	3	Local	Continue regular maintenance
3913	Bunker AM (Sinkin)	Salem	0.50	Aggregate	3	Local	Continue regular maintenance
3914	Bunker AN (Sinkin)	Salem	0.50	Aggregate	3	Local	Continue regular maintenance
3919	Bunker AS (Sinkin)	Salem	0.40	Aggregate	3	Local	Continue regular maintenance
3920	Bunker AT (Sinkin)	Salem	0.40	Aggregate	3	Local	Continue regular maintenance
4144	Whitten	Eleven Point	0.60	Aggregate	3	Local	Continue regular maintenance. Candidate for county road easement. Stream crossing.
4249	Edmundson Pond	Eleven Point	1.40	Aggregate	3	Local	Continue regular maintenance
4282	Watercress Rec Area	Eleven Point	0.70	Asphalt	4	Local	Continue regular maintenance. Stream crossing.
4349	Dear Leap	Doniphan	2.20	Asphalt	4	Local	Area receives frequent flooding. Determine long-term plan for recreation area.
4785	Fourche Lake	Doniphan	0.70	Aggregate	3	Local	Bladed annually
5108	Brown	Houston	1.30	Aggregate	3	Local	Bladed annually
5136	McBride	Houston	1.30	Aggregate	3	Local	Bladed annually. Stream crossings.

Source: Mark Twain National Forest, Jan. 2003

Regular maintenance may include cyclic mowing and limbing, aggregate surface replacement, and asphalt overlay and crack repair.

APPENDIX 5: SURVEY INSTRUMENT

Mark Twain National Forest Roads Analysis Survey

The Meramec Regional Planning Commission is assisting the U.S. Forest Service in completing an analysis of roads located on Mark Twain National Forest (MTNF) lands in the state of Missouri. The analysis will assist decision makers with critical information to develop road systems that are safe and responsive to public needs and desires, are affordable and efficiently managed, have minimal negative ecological effects on the land, and are financially feasible. Please work with your county commissions to respond to the questions below regarding the Mark Twain National Forest land in your jurisdiction. Thank you in advance for your participation.

County: _____

Names/Titles/Phone Numbers of those participating in survey/interviews:

1. _____
2. _____
3. _____
4. _____

Interviewer Information:

Person conducting survey: _____

Phone number: _____

Mailing Address: _____

General Information:

1. How familiar are you with the Mark Twain National Forest located within your county?

(a) Very Familiar ____ (b) Somewhat Familiar ____ (c) Not Familiar ____

2. Do you personally use the forest?

(a) Frequently ____ (b) Occasionally ____ (c) Never ____

3. From your perspective as an elected official, what are the greatest benefits the Forest offers residents in your county?

4. From your perspective as an elected official, what problems does the Forest present for your county?

5. From your perspective as an elected official, what benefits does the Forest road system offer residents and agencies in your county? _____

RECREATION:

Please indicate to what extent interviewees agree or disagree with the following statements. If interviewees strongly agree or strongly disagree, please explain in the comment section following each question.

<p>Forest recreation areas are classified as roaded or unroaded. Roaded areas contain roads constructed or maintained for long-term highway vehicle use. These may be public, private or forest development roads. Unroaded lands contain no roads, or only roads built for temporary access and other remnants of short-term-use roads associated with fire suppression; timber harvest; and oil, gas, or mineral activities; as well as travel-ways resulting from off-road vehicle use. Unroaded lands in the Mark Twain National Forest are mainly in wilderness areas or lands where no roads have been developed. Unroaded areas make up about 10 percent of the Forest.</p>	Unroaded					Roaded				
	(a)	(b)	(c)	(d)	(e)	(a)	(b)	(c)	(d)	(e)
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. Current unroaded/roaded Forest land offers ample opportunities for recreational activities such as hunting, hiking, picnicking, birdwatching, floating, caving, fishing etc.										
Comments: _____										

2. More unroaded/roaded recreation areas are needed.										
Comments: _____										

3. The development of new roads would affect the <u>quantity or type</u> of unroaded/roaded recreation opportunities.										
If you agree, please describe what impact new roads would have: _____										

Other comments: _____										

	Unroaded					Roaded				
	(a)	(b)	(c)	(d)	(e)	(a)	(b)	(c)	(d)	(e)
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
4. The development of new roads would affect the <u>quality</u> of unroaded/roaded recreation opportunities. If you agree, please describe in what way: _____										

5. Returning existing roads to their natural condition (known as decommissioning) would affect the <u>quantity or type</u> of unroaded/roaded recreation opportunities. If you agree, please describe what impact decommissioning roads would have: _____										

6. Returning existing roads to their natural condition would affect the <u>quality</u> of unroaded/roaded recreation opportunities. If you agree, please describe what impact decommissioning roads would have: _____										

7. Changes in the maintenance of existing roads will affect the <u>quantity or type</u> of unroaded recreation opportunities. If you agree, please describe what impact changes in maintenance would have: _____										

8. Changes in the maintenance of existing roads will affect the <u>quality</u> of unroaded recreation opportunities. If you agree, please describe what impact changes in maintenance would have: _____										

9. From your perspective, describe the level of usage of unroaded/roaded Forest areas in your county.

Unroaded:

- (a) No use
- (b) Minimal use
- (c) Moderate use
- (d) Heavy use

Roaded:

- (a) No use
- (b) Minimal use
- (c) Moderate use
- (d) Heavy use

10. Who uses unroaded/roaded recreational areas in the Forest in your jurisdiction?

	<u>Unroaded</u>	<u>Roaded</u>
(a) Whites	<input type="checkbox"/>	<input type="checkbox"/>
(b) Native Americans	<input type="checkbox"/>	<input type="checkbox"/>
(c) Blacks	<input type="checkbox"/>	<input type="checkbox"/>
(d) Other Races	<input type="checkbox"/>	<input type="checkbox"/>
(e) Hispanics	<input type="checkbox"/>	<input type="checkbox"/>
(f) Youth Groups (Boy/Girl Scouts, etc.)	<input type="checkbox"/>	<input type="checkbox"/>
(g) Church Groups	<input type="checkbox"/>	<input type="checkbox"/>
(h) School Children	<input type="checkbox"/>	<input type="checkbox"/>
(i) Young Adults (20-29)	<input type="checkbox"/>	<input type="checkbox"/>
(j) Teenagers	<input type="checkbox"/>	<input type="checkbox"/>
(k) Adults (30-65)	<input type="checkbox"/>	<input type="checkbox"/>
(l) Elderly	<input type="checkbox"/>	<input type="checkbox"/>
(m) Non Profit Organizations	<input type="checkbox"/>	<input type="checkbox"/>
(n) Disabled	<input type="checkbox"/>	<input type="checkbox"/>
(o) Other: (list)	<input type="checkbox"/>	<input type="checkbox"/>

11. In your county, what are the most common recreational uses for unroaded/roaded areas?

	<u>Unroaded</u>	<u>Roaded</u>
(a) Hunting	<input type="checkbox"/>	<input type="checkbox"/>
(b) Camping	<input type="checkbox"/>	<input type="checkbox"/>
(c) Hiking	<input type="checkbox"/>	<input type="checkbox"/>
(d) Equestrian	<input type="checkbox"/>	<input type="checkbox"/>
(e) Picnicking	<input type="checkbox"/>	<input type="checkbox"/>
(f) Floating	<input type="checkbox"/>	<input type="checkbox"/>
(g) Fishing	<input type="checkbox"/>	<input type="checkbox"/>
(h) Sightseeing	<input type="checkbox"/>	<input type="checkbox"/>
(i) Driving ATVs	<input type="checkbox"/>	<input type="checkbox"/>
(j) Cycling	<input type="checkbox"/>	<input type="checkbox"/>
(k) Caving	<input type="checkbox"/>	<input type="checkbox"/>
(l) Backpacking	<input type="checkbox"/>	<input type="checkbox"/>
(m) Bird Watching	<input type="checkbox"/>	<input type="checkbox"/>
(n) Photography	<input type="checkbox"/>	<input type="checkbox"/>
(o) Walking/Running	<input type="checkbox"/>	<input type="checkbox"/>
(p) Boating	<input type="checkbox"/>	<input type="checkbox"/>
(q) Other (list) _____	<input type="checkbox"/>	<input type="checkbox"/>

12. Outside of the forest, are there other nearby public locations where these activities can be enjoyed?

Unroaded

Yes _____

No _____

Roaded

Yes _____

No _____

13. On a scale of 1-10, with 10 being the most attachment, how strong of an attachment do you think the participants have to the areas in which they participate in the above activities, listed in question 11.? _____

Passive-Use Value:

Passive-use value is a value or benefit people receive from the existence of a specific place, condition or thing, independent of any intention, hope or expectation they may have for active use. Passive-use value is an intangible, sentimental value or a psychological benefit that can't be tied to a dollar figure. This benefit may be received because of spectacular scenic views, pristine wilderness, unusual geological or natural conditions, unique cultural heritage resources, etc.

1. Are you aware of any areas of the forest in your jurisdiction that may have unique cultural, traditional, symbolic, sacred, spiritual or religious significance?

Yes _____

No _____

If yes, please identify the area. _____

2. What, if any, groups of people in your jurisdiction (ethnic groups, subcultures, and so on) hold cultural, symbolic, spiritual, traditional, or religious values that may be affected by road management?

3. Do you believe that road construction, closure or decommissioning significantly affect passive-use value?

Yes _____

No _____

If yes, how? _____

Social Issues:

Forest roads represent more than just a travelway to many people. Some people perceive roads to be the means to access forest resources, on which they may be economically and culturally dependent. Some perceive roads to be a deterrent to healthy wildlife habitat, or unacceptable contributors to stream sedimentation. Certain types of recreation may be road-dependent, and people express interest in wanting the roads maintained. Other types of recreation may be negatively affected by roads and road use, and people thus express interest in wanting roads closed or decommissioned.

1. Who are the direct users of the road system and of the surrounding areas in the forest in your jurisdiction?

- | | |
|---|--|
| <input type="checkbox"/> (a) residents of surrounding communities | <input type="checkbox"/> (e) visitors/tourists |
| <input type="checkbox"/> (b) ethnic groups/subcultures | <input type="checkbox"/> (f) religious groups |
| <input type="checkbox"/> (c) disabled | <input type="checkbox"/> (g) commercial users |
| <input type="checkbox"/> (d) Other (specify) _____ | |

2. What activities are they directly participating in on the forest?

- | | | |
|---|--|--|
| <input type="checkbox"/> (a) Hunting | <input type="checkbox"/> (h) Fishing | <input type="checkbox"/> (n) Backpacking |
| <input type="checkbox"/> (b) Camping | <input type="checkbox"/> (i) Sightseeing | <input type="checkbox"/> (o) Bird Watching |
| <input type="checkbox"/> (c) Hiking | <input type="checkbox"/> (j) Driving ATVs | <input type="checkbox"/> (p) Photography |
| <input type="checkbox"/> (d) Equestrian | <input type="checkbox"/> (k) Cycling | <input type="checkbox"/> (q) Walking/Running |
| <input type="checkbox"/> (e) Picnicking | <input type="checkbox"/> (l) Caving | <input type="checkbox"/> (r) Boating |
| <input type="checkbox"/> (f) Floating | <input type="checkbox"/> (m) Commercial Activities | |
| <input type="checkbox"/> (g) Other (list) _____ | | |

3. Where are these activities taking place on the Forest?

4. Why do people value their specific access to national forest and grasslands?

5. Which do the people in your jurisdiction value more:

☐ The use of natural resources that exist in the Forest (such a extraction of timber, minerals, and access to roads)

OR ☐ The area's contribution to increased solitude, quiet, and refuge for plants and animals.

6. How do the road system and road management affect people's sense of place? (For instance, how would users feel about road construction, decommissioning, closing or lack of maintenance as these relate to their value of the forest?)

Civil Rights and Environmental Justice

1. Is the road system used or valued differently by minority, low-income or disabled populations than by the general population? ☐ Yes ☐ No

If yes, in what way? _____

2. Would potential changes to the road system or its management negatively impact minority, low-income, or disabled populations more so than other groups? ☐ Yes ☐ No

If yes, how? _____

ECONOMICS

1. What commercial activities take place within the forest within your county?

☐ (a) Timbering/Wood Products ☐ (c) Grazing ☐ (e) Other: list
☐ (b) Mining ☐ (d) Recreation (outfitters, concessionaires) _____

2. Which commercial activity is most predominant? _____

3. How dependent are county residents on the forest in your county for their livelihood?

☐ (a) Very dependent
☐ (b) Somewhat dependent
☐ (c) Not at all dependent

4. Would the construction of additional roads ☐ reduce ☐ expand ☐ not impact commercial forest activities in your county?

Explain: _____

5. Would the closure or decommissioning of existing forest roads ☐ reduce ☐ expand ☐ not impact commercial forest activities in your county?

Explain: _____

Law Enforcement

1. Does your county have an agreement with Mark Twain National Forest to patrol the forest in your area?

☐ Yes ☐ No

2. What are the most pressing problems, from a law enforcement perspective, facing the Forest? _____

3. What are the most common criminal activities occurring in the Forest in your area? _____

4. From a law enforcement perspective, should access to the Forest be _____ *increased* _____ *decreased*.
Explain: _____

GENERAL INFORMATION

1. Overall, what suggestions do you have for improving the forest in your county? _____

2. Overall, what suggestions do you have for improving the forest road system in your county? _____

3. Would you like to have a better working relationship with the Mark Twain National Forest?

____yes ____no

If yes, explain: _____

2. What are the most pressing problems, from a law enforcement perspective, facing the Forest? _____

3. What are the most common criminal activities occurring in the Forest in your area? _____

4. From a law enforcement perspective, should access to the Forest be _____ *increased* _____ *decreased*.
Explain: _____

GENERAL INFORMATION

1. Overall, what suggestions do you have for improving the forest in your county? _____

2. Overall, what suggestions do you have for improving the forest road system in your county? _____

3. Would you like to have a better working relationship with the Mark Twain National Forest?

____yes ____no

If yes, explain: _____

[illegible]

September 2002

APPENDIX 6: SURVEY RESULTS COMPILATION BY ISSUE

Mark Twain Survey - Participants List							
		Names/titles of those participating in survey/interviews:			Interviewer information:		
Survey Number	County	Name/Phone	Name/Phone	Name/Phone	Survey conducted by	Phone	Mailing Address
1	Crawford County	Art Hughes, Presiding Commissioner	Ed Mitchell, Assoc. Commissioner	Connie Smith, County Clerk	Richard Cavender, Connie Willman	573-265-2993	MRPC, 4 Industrial Dr. St. James, MO 65559
2	Crawford County	Neil Swyers, Assoc. Comm			Connie Willman, Richard Cavender	573-265-2993	MRPC, 4 Industrial Dr. St. James, MO 65559
3	Washington County	Robert Simpson, Presiding Commissioner	Gary Yount, Associate Commissioner	Kevin Isgrig, Associate Commissioner	Connie Willman	573-265-2993	MRPC, 4 Industrial Dr. St. James, MO 65559
4	Boone County	Skip Elkin, Commissioner, 886-4305(573)			Stan Shawrer	573-886-4330	Boone Co. Planning, 801 E. Walnut St. Rm 210, Columbia, MO 65201
5	Calloway County	Rodney Garnett, County Commissioner, 573-642-0737	Lee Fritz, Presiding Commissioner, 573-642-0737		Gary Taylor	573-657-9779	Mid-Missouri Regional Planning Commission, PO Box 140, Ashland, MO 65010
6	Oregon County	Leo Warren, Presiding Commissioner	John Wrenfrow, Associate Commissioner	Buddy Wright, Associate Commissioner	James Dancy	417-256-4226	SCOCG, PO Box 100, Pomona, MO 65789
7	Shannon County	Shane VanSteenis, Presiding Commissioner	Herman Kelly, Associate Commissioner	Dean Cox, Associate Commissioner	James Dancy	417-256-4226	SCOCG, PO Box 100, Pomona, MO 65789
8	Wright County	Rex Epperly, Presiding Commissioner	Frank Bolt, Associate Commissioner		James Dancy	417-256-4226	SCOCG, PO Box 100, Pomona, MO 65789
9	Texas County	Larry Southern, Presiding Commissioner	Linda L. Garrett, Associate Commissioner	Don Troutman, Associate Commissioner	James Dancy	417-256-4226	SCOCG, PO Box 100, Pomona, MO 65789
10	Howell County	Larry Spence, Presiding Commissioner	Bob Vaughn, Associate Commissioner	Mark Collins, Associate Commissioner	James Dancy	417-256-4226	SCOCG, PO Box 100, Pomona, MO 65789

11	Bollinger County	Kenny Trentham, Presiding Comm, 573-238-4346	Larry VanGennip, Associate Commissioner	Wayne Whitener, Associate Commissioner	Brian Balsman	573-547-8357	SEMO, PO Box 366, Perryville, MO 63775
12	Iron County	Ronald Murphy, Presiding Commissioner			Brian Balsman	573-547-8357	SEMO, PO Box 366, Perryville, MO 63775
13	Madison County	Robert Mooney, Presiding Commissioner	Ray Roberts, Associate Commissioner	Larry Mungle, Associate Commissioner	Brian Balsman	573-547-8357	SEMO, PO Box 366, Perryville, MO 63775
14	St. Francois County	Mark Hedrick, Presiding Commissioner	Bill Bradley, Associate Commissioner	Ronald Var Vera, Associate Commissioner	Brian Balsman	573-547-8357	SEMO, PO Box 366, Perryville, MO 63775
15	Ste. Genevieve County	Dennis Huck, Presiding Commissioner	Linda Hermann, Associate Commissioner	Ray Gettingear, Associate Commissioner	Brian Balsman	573-547-8357	SEMO, PO Box 366, Perryville, MO 63775
16	Barry County	Cherry Warren, Presiding Commissioner 417-847-2561	J. H. Edens, Associate Commissioner	Dayton Mackey, Associate Commissioner	Debi Richardson	417-836-6900	SMCOG, 901 S. National Ave., Springfield, MO 65804
17	Stone County	Tony DeLong, Presiding Commissioner	Jerry Dodd, Associate Commissioner	Denny McCrorey, Associate Commissioner	Debi Richardson	417-836-6900	SMCOG, 901 S. National Ave., Springfield, MO 65804
18	Christian County	Roy Matthews, Presiding Commissioner	Bill Barnett, Associate Commissioner	Tom Chudomelka, Associate Commissioner	Diane May	417-836-6900	SMCOG, 901 S. National Ave., Springfield, MO 65804
19	Taney County	Don Swan, Associate Commissioner	Ron Herschend, Associate Commissioner		Diane May	417-83 6- 6900	SMCOG, 901 S. National Ave., Springfield, MO 65804
20	Pulaski County	Harold York, Presiding Commissioner	Dennis Thornsberry, Associate Commissioner	Gary Carmack, Associate Commissioner	Eric Barron	573-346-5616	LOCLG, PO Box 786, Camdenton, MO 65020
21	Laclede County	Joe Pickering, Associate Commissioner			Jim Dickerson	573-346-5616	LOCLG, PO Box 786, Camdenton, MO 65020
22	Ozark County	David Morrison, Presiding Commissioner	Rex Robertson, Associate Commissioner		James Dancy	417-256-4226	SCOCG, PO Box 100, Pomona, MO 65789
23	Douglas County	Donald Potter, Presiding Commissioner	Jimmy Thompson, Associate Commissioner	Larry Pueppke, Associate Commissioner	James Dancy	417-256-4226	SCOCG, PO Box 100, Pomona, MO 65789

24	Dent County	Jim Biggs, Presiding Commission	J. J. Tune, Associate Commissioner	Bobby Simpson, Associate Commissioner	Connie Willman	573-265-2993	MRPC, 4 Industrial Drive, St. James, MO 65559
25	Reynolds County	Paul Wood, Presiding Commissioner			Paul W. Wood	573-648-2494	PO Box 10, Centerville, MO 63633
26	Carter County	Gene Oakley, Presiding Commissioner			Gene Oakley	573-323-4527	Van Buren, MO 63965
27	Ripley County	Bill Kennon, Presiding Commissioner	Jesse Roy, Commissioner		Jerry Halley	573-996-4075-4846	HC 7 Box 172, Doniphan
28	Wayne County	Brian Polk, Presiding Commissioner	Alan Lutes, County Clerk	Cleo Crawford, Bud Snyder, Commissioner,	Brian Polk	573-224-3012	Greenville, MO 63944
29	Butler County	Joe Humphrey, Presiding Commissioner	John Dunivan, County Clerk		Joe Humphrey	573-686-8050	Poplar Bluff, MO 63901
30	Phelps County	Randy Verkamp, Presiding Commissioner	Bud Dean, Commissioner	Carol Bennett, County Clerk	Richard Cavender, Connie Willman, Bonnie Prigge	573-265-2993	MRPC, 4 Industrial Dr. St. James, MO 65559

Mark Twain Survey - General Information					
Survey #	How familiar are you with the Mark Twain National Forest located within your county?	Do you personally use the Forest?	What are the greatest benefits the Forest offers residents in your county?	What problems does the Forest present for your county?	What benefits does the Forest road system offer residents and agencies in your county?
1	Somewhat	Occasionally	People in town, outdoor recreation, used for hunting, logging, considerable amounts	Marijuana growing, illegal activities, meth labs	Opportunities to drive for recreation (may not be able to work), access to other places, law enforcement
2	Very	Occasionally	Hunting, camping, horseback riding, recreation.	Meth labs.	Fire protection, hiking, hunting.
3	Very	Frequently	Timber sales, Recreation, Hunting/Fishing, Wood cutting	Had to take our forest roads with not enough dollars to cover cost to maintain. Maintenance increases all the time	Offers opportunity for recreation/timbering/access to other property
4	Very	Occasionally	Unspoiled recreational land with a variety of topography.	Attractive to users that are unfamiliar with surrounding private land. This results in trespass, discharge of firearms near livestock and houses.	Opportunity to experience nature near an urban setting by use of access roads.
5	Very	Frequently	Hunting area for sportsman - Hiking trails - Grazing livestock - Cedar Creek grazing assoc.	Pay very little taxes - not enough pelt funds. Law enforcement of forestry land problem i.e. marijuana growing and meth labs.	A place to camp, hike, train dogs in camp area, and horse trail riding.
6	Very	Occasionally	Recreation, Timber industry	Poor maintenance, closing some roads, too much ownership of forest land in County, payment in lieu of taxes in bad times.	Not well maintained - no benefits. Should be considered more than logging roads. Provides throughway to County seat/access to riders.
7	Very	Frequently	Public access, recreation	Lots of land out of public hands, restricts tax base.	Travel ways, mail routes, school routes, public access, recreation access

8	Very	Frequently	Retaining nature	No problems	Travel ways, Montgomery Township, NE corner
9	Very	Occasionally	Timber harvest, recreational, hunting	Hurts the tax revenue. Property tax. Not as high as private. Forest service puts up gates, restricts usage.	Travel way, mail routes, school buses, tourism. Good maintenance on roads
10	Very	Occasionally	Timber industry, hunting	Drug manufacture and usage	Provides residential and recreational transportation
11	Somewhat	Occasionally	Some recreation	No tax money	None
12	Very	Frequently	Recreation, hunting, hiking, timber sales which helps the local economy and income from royalties to the County	Slows economic development. It is a haven for meth labs.	Tourism and helps local movements of traffic
13	Somewhat	Occasionally	Jobs, hunting, recreation, tourist	Loss of tax revenue	Access and hunting and hiking
14	Very	Frequently	Place for recreation	None	No road system in the County that the county does not maintain
15	Somewhat	Never	Recreation and hunting opportunities	Law enforcement	Recreational opportunities
16	Very	Occasionally	Recreation, hunting, ATVs, hiking, bird watching	Additional law enforcement	Access to recreation, residential access to homes
17	Somewhat (1), Very (2)	Occasionally (1), Frequently (2)	Recreation, pristine buffers, getaway, hike, hunt	Lack of good access, increase in crime such as meth labs and marijuana	Access to personal homes, recreation, pristine, valuable to all of county

18	Very	Occasionally	Recreation, hunting, horseback riding in particular	Lack of funding generated for schools, other public services. Impact on law enforcement, complaints of ATVs operating outside of designated areas and damage caused, broken fences. Meth labs, marijuana plots, etc.	Not much (due to poor maintenance)
19	Somewhat	Occasionally (1), Never (1)	Recreation, hunting, ATV trails	Drug production and sale, Trash, Crime - poaching, car breaking - at locations where people park and then walk into unroaded areas	Roads provide access to recreation areas, Roads also provide access to light crime, fight fires and look for lost people. Cannot use the forest without roads
20	Somewhat	Occasionally	The opportunity to get out in the woods, participate in nature, hunt, fish, shoot	Trash dumping, growing and manufacturing drugs	Attracts hunters/sportsmen, Benefits city populations who want to come out to the forest
21	Very	Occasionally	Recreation	It is rural and isolated. There is some poaching and illegal cultivation	Near nonexistent
22	Very	Occasionally	Preservation of land, provides hunting for non-land owners, provides travel ways for necessary community and rural activities, to work, school, mail routes, milk routes, etc.	Litter from users and drug manufacture and marijuana plants	Provides travel ways for buses, milk trucks, mail routes, residents going to work, concrete trucks and other dump trucks, some loggers
23	Very	Occasionally	Forest service has built road (Glade Top Trail) and bridge which is a benefit to County. Provides hunting and for residents. Counties receive funding for drug awareness programs also	Have been great to work with - no serious problems	Travel ways
24	Very	Occasionally	At one time, timber, firewood, recreation, hunting	Drug related activities, hideouts, downed trees, people sometimes call county officials. Forest not supporting local communities through logging, etc., like it should do.	Access, cross through, in some districts, county has taken over the roads

25	Very	Frequently	Recreation, timber industries	Meth labs, drug and marijuana problems	Roaded areas and unroaded areas offer county residents and visitors more opportunity to recreation and timber related employment
26	Very	Occasionally	In the past, timber harvesting was a great benefit. However, groups such as Hartland have caused timber sales to be held up. Many use the forest for hunting and some camping	Access for law enforcement - mecca for meth labs	Employment for many people in logging and related endeavors (crucial). Also provides recreation for local people and others (hunting in particular)
27	Very	Frequently	Hunting, hiking, horseback riding, being close to Real Forest	All roads not maintained regularly, dead trees along roads	Access to backwoods hunting and river banks
28	Somewhat	Occasionally	Natural resource access to hunting, trails, etc. outdoor recreation, timber market that creates jobs and retreat	Secluded areas for dumping, meth labs.	Easier access for recreational use, access to fight fires
29	Very	Frequently	Recreation, hunting	Leaves	Limited, need more roads
30	Somewhat	Occasionally	Recreational opportunity, timber resources	No taxes, lots of acres with not taxes, pilot payment in lieu of taxes to go to schools	

Mark Twain Survey - Recreation #1-2						
Please indicate to what extent interviewees agree or disagree with the following statement.						
Survey #	Unroaded forest land offers ample opportunities for recreational activities	Roaded forest land offers ample opportunities for recreational activities	Comments	More unroaded recreation areas are needed	More roaded recreation areas are needed	Comments
1	Strongly agree	Strongly agree		Disagree	Disagree	
2	Strongly agree		These are widely used in summer and fall seasons.	Agree		We are getting more and more city people coming out
3	Disagree	Disagree	A lot of areas have been closed off. Need to take	Agree	Agree	
4		Agree			Agree	
5	Disagree	Agree		Agree	Disagree	Yes-especially on forestry land.
6	Agree	Agree		Agree	Agree	
7	Strongly agree	Strongly agree		Agree	Agree	Develop more recreation areas in the land they own.
8	Agree	Agree	Very accessible, one part requires going across private land	Agree	Agree	More needs to be developed
9	Agree	Agree	With exception of Paddy Creek area	Strongly disagree	Strongly disagree	Not more land, more recreation within present land. Need new mission statement to clearly state forest service objectives
10	Disagree	Disagree		Strongly agree	Strongly agree	More roads or areas needed for ATV and off-road vehicle use. Dirt bikes, etc.
11	Disagree	Disagree		Disagree	Disagree	
12	Agree	Agree		Agree	Agree	

13	Disagree	Disagree		Strongly agree	Strongly agree	
14	Agree	Agree		Agree	Agree	
15	Neutral	Neutral		Neutral	Neutral	
16	Agree	Agree		Disagree	Agree	More roaded areas are needed, but doubt it will happen
17	Agree	Agree	Not enough roads to go through forest. Roads not always good	Strongly agree	Strongly agree	Especially better maintenance of roads
18	Disagree	Strongly agree	Unroaded areas difficult to get to, therefore limiting recreation opportunities	Disagree	Disagree	Do not want more roaded recreation areas without an increase in supervision and maintenance
19	Disagree	Agree	Difficult to get into unroaded areas for recreation. Need better access	Disagree	Agree	Can't take small children into many areas for recreation. Want more access, but not a highway
20	Agree	Agree		Strongly disagree	Strongly disagree	
21	Neutral	Disagree		Neutral	Agree	
22	Agree	Agree		Agree	Agree	More development needed with existing areas, more trash containers needed at present sites
23	Agree	Agree		Agree	Agree	More development would be welcome
24	Disagree	Disagree	The roads don't access recreational areas well	Agree	Agree	
25	Agree	Agree		Strongly agree	Strongly agree	
26	Agree	Disagree		Neutral	Agree	
27	Agree	Agree		Agree	Neutral	
28	Disagree	Neutral		Disagree	Agree	

29	Strongly disagree	Strongly disagree		Strongly agree	Strongly agree	
30	Strongly agree	Strongly agree	Citizens who don't own land	Disagree	Disagree	Area too small, can be accessed, Phelps County may have none

Mark Twain Survey - Passive-Use Value					
Survey #	Are you aware of any areas of the forest in your jurisdiction that may have unique cultural, traditional, symbolic, sacred, spiritual or religious significance?	If yes, identify the area	What, if any, groups of people in your jurisdiction hold cultural, symbolic, spiritual, traditional, or religious values that may be affected by road management?	Do you believe that road construction, closure or decommissioning significantly affect passive-use value?	If yes, how?
1	No		Rainbow people	Yes	Any time you build a road into an area, you will affect the natural beauty. Lack of roads may keep people from accessing some areas, limiting their ability to enjoy some areas. A lot of new construction not needed. Take care of what is there.
2	No		None		
3	Yes	Historical sites-old cemeteries-iron furnaces-old Palmer Church	Rainbow people	Yes	Might be able to see some of the sites listed above - need roads to increase.
4	No		Native American populace may hold spiritual value for some areas that are not commonly known.	No	
5	Yes	Devils Backbone	None. They go where they please.	No	
6	Yes	Irish Wilderness, Old Mills, Geological Artifacts	Rainbow gatherings	Yes	Restriction of access
7	Yes	Ozark National Scenic River ways, Current River and Jacks Fork River	Cherokee Indian ceremonies, Church groups	Yes	Closure would do severe harm to community, would upset the entire populace.
8	No		None	Yes	Restrict access, be hopping mad
9	Yes	Locally known, not on large scale - bluffs, etc. Indian paintings, etc.	Cherokees, other Indian groups.	Yes	Restrict access

10	Yes	Cultural, site of CCC camp, Civilian Conservation Corp, Former State Wildlife Refuge	CCC camp reunion	Yes	Restrict, limit access
11	Yes	Blue Hole area	Not aware of any	Yes	
12	Yes	Various scenic areas in the forest	None	No	
13	Yes	Rock Pile Wilderness area	None	No	
14	No			No	
15	No		None	No	
16	No		None	Yes	Not being able to access area
17	Yes	Piney	Native residents, Indian descent	Yes	Closure or decommissioning will cause a great loss of access to pristine areas, construction will increase commercial development
18	Yes	Place of first deer kill important to many hunters, but otherwise not aware of any such areas	Probably none	Yes	Only the strongest can use unroaded areas. Decommissioning roads will further limit use of the forest by the young, elderly and disabled. More roads may increase passive use acceptance
19	No		NA	Yes	People cannot use or enjoy the forest if roads decommissioned
20	No			No	
21	No		None	Yes	
22	Yes	Church revivals and weddings at the Caney Picnic grounds	Churches and the Lions Club	Yes	Usage of the cultural areas is a tradition, with annual scheduled events. Road closures would be very controversial and received negatively by the public
23	Yes	Near Twin Bridges, Cherokee Indian Branch	Indian group wants road built into the Indian Burial area near Twin Bridges	Yes	Would cause great controversy

24	Yes	Little Scotia, Howe's Mill	None known now	Yes	If new roads, usage increases. If folks can get closer, more use. If close, opposite.
25					
26	No		No	Yes	Closure cuts people off when they may just wish to take a drive in the forest
27	No		None	No	
28	No		None to our knowledge	No	
29	Yes	Katie Trail		Yes	
30	Yes	Aware of artifacts exist, but no specific area, geological sites but not known	None known	Yes	If close road, opp for passive use occurs when you drive around, people want to know it is there if they want to use it

Mark Twain Survey - Social Issues #1

<i>Who are the direct users of the road system and of the surrounding areas in the forest in your jurisdiction?</i>							
Survey #	Residents of surrounding communities	Ethnic groups/subcultures	Disabled	Other	Visitors/tourists	Religious groups	Commercial users
1	Yes	Rainbow people			Yes		Yes
2	Yes	Yes			Yes	Yes	
3	Yes	Yes			Yes	Yes	Yes
4	Yes				Yes		
5	Yes				Yes		Yes
6	Yes	Yes	Yes	School buses, mail routes, gas tracks	Yes	Yes	Yes
7	Yes	Yes	Yes		Yes	Yes	Yes
8	Yes	Yes	Yes		Yes	Yes	Yes
9	Yes	Yes	Yes	City people seeking recreation areas	Yes	Yes	Yes
10	Yes	Yes	Yes		Yes	Yes	Yes
11	Yes		Yes		Yes		Yes
12	Yes		Yes		Yes	Yes	
13	Yes				Yes		
14	Yes						
15	Yes				Yes		
16	Yes	Yes	Yes		Yes	Yes	Yes
17	Yes	Yes	Yes		Yes		Yes
18	Yes				Yes		
19	Yes			Saw mills (2) right outside of forest Bradleyville	Yes		Yes
20	Yes				Yes		
21	Yes						
22	Yes	Yes	Yes		Yes	Yes	Yes
23	Yes	Yes	Yes		Yes	Yes	Yes
24	Yes			Rainbow People	Yes	Yes	Yes
25	Yes		Yes		Yes	Yes	
26	Yes		Yes		Yes		Yes
27	Yes				Yes		
28	Yes		Yes		Yes		Yes
29	Yes		Yes		Yes		Yes

30	Yes		Yes	Access across to other land by locals	Yes	Yes	Yes

Mark Twain Survey - Social Issues #6

Survey #	How do the road system and road management affect people's sense of place?
1	If road maintenance ceases, the county officials will hear about it
2	People would be very upset.
3	If they have input on decisions, they are OK. They don't want it to happen without their input. Each area is different.
4	There would be a mix of feelings among users - some would be pleased to have improved access - others would see this as degradation of the environment.
5	They travel where roads are open and passable.
6	Need better maintenance for current usage. Don't want roads closed.
7	The people would not be in agreement with any changing, closing, decommissioning, or lack of maintenance.
8	Would not like it
9	Wouldn't like it, would strongly object
10	Any decommissioning would be viewed as decreasing value of the local forest to area residents
11	Would not like closing roads etc.
12	They oppose decommissioning of roads
13	
14	Would not like lack of maintenance

15	Unsure, some would approve and others disapprove
16	Some user's would not care, others would
17	The public would cause an uprising if access to the forest was unavailable because it belongs to the people (all)
18	Most people would feel that road construction or decommissioning roads would devalue the forest. Lack of maintenance is viewed as a problem
19	Decommissioning roads will reduce value. County would receive many complaints if roads decommissioned. Currently also get many complaints for poor road maintenance. Complaints would increase if maintenance reduced
20	Don't build more roads or decommission any
21	Need a few more roads
22	Would really cause controversy - residents want better maintenance and more access. Different groups want different things and some activities does not mix. Some want designated areas and trails for ATV and cycle use, like is available at Chadwick, Mo.
23	They would not like it and probably petition for new management
24	Want it open so they can access
25	Most people in our area would like to see more roads constructed and maintained throughout the forest area
26	Generally they desire more roads (better access). Sentiment for closing roads is minimal
27	There will be mixed emotion, some pro, some con to any activity or change
28	Most people are used to having some type or form of roads whether it would be a poorly maintained road or well maintained gravel road. Now they are realizing that only the graveled numbered roads can be used. Most people value ease of access over solitude
29	Need more access
30	Majority of residents want access, do not want to work

Mark Twain Survey - Civil Rights and Environmental Justice

Survey #	Is the road used or valued differently by minority, low-income or disabled populations than by the general population?	If yes, in what way?	Would potential changes to the road system or its management negatively impact minority, low-income, or disabled population more so than other groups?	If yes, how?
1	Yes	Disabled accessibility not as important. Low income - more b/c no cost/low cost	No	
2	No		No	
3	No		Yes	Closing would input negatively disabled.
4	Yes	There is less active use by these groups.	No	
5	No		No	
6	Yes	People who are disabled and elderly are restricted in usage.	Yes	More public transit would help these groups.
7	No		No	
8	No		No	
9	No		No	
10	No		Yes	Further limit access, especially to low income
11	No		Yes	Land they can use because they can't afford their own land
12	No		Yes	Decommissioning roads or lowering of maintenance would slow use and timbering in the forest
13	No		No	
14	No			
15	No		No	
16	No		No	
17	No (2	One comment was yes it was because some felt that only those people with money and car could take advantage of access	Yes	If roads are restricted to allow less access to activities. Also if access areas are less accessible, disabled cannot get to easily
18		Difficult to answer this question, not known	Yes	Perhaps would impact disabled persons if roads decommissioned
19		Don't know. However, use of forest is free - provides opportunity for low-income families to recreate	Yes	Any potential changes to the road system that decreases access or reduces maintenance would negatively impact low income and disabled population use of the forest
20	No			
21	No		No	
22	No		No	
23	No		No	

24	No		No	
25	No		No	
26	Yes	Disabled can hunt and generally enjoy the forest without roads, they cannot	Yes	If roads are closed
27	No		No	
28	Yes	This group of people is unable to use remote areas of the forest due to disability or low income and not have finances to spend on equipment	No	
29	Yes	A minority of Butler County is low-medium income	Yes	More access
30	Yes	Because low income get an opportunity because of no cost	Yes	Because low income get an opportunity because of no cost

Mark Twain Survey - Economics #1-3

Mark Twain Survey - Economics #1-3							
Survey #	What commercial activities take place within the Forest within your county?					Which commercial activity is most predominant?	How dependent are county residents on the Forest in your county for their livelihood?
	Timbering/ Wood Products	Mining	Grazing	Recreation	Other		
1	Yes			Yes		Timbering	Somewhat
2	Yes	Yes		Yes		Timber	Somewhat
3	Yes	Yes			Roots-leaves (if legal)	Timbering	Somewhat
4			Yes			Grazing	Not at all
5	Yes		Yes	Yes	Horse trails	Timbering and grazing.	Somewhat
6	Yes	Yes		Yes	Core drilling	Canoeing/timbering	Somewhat
7	Yes	Yes		Yes		Recreating, timbering close second	Very, logging
8	Yes					Timbering	Somewhat
9	Yes	Yes	Yes	Yes	Mining-gravel	Timber	Somewhat
10	Yes		Yes	Yes		Timbering	Somewhat, logging industry
11	Yes	Yes		Yes		Wood products	Very
12	Yes	Yes		Yes		Timbering/mining	Very
13	Yes					Timbering	Somewhat
14	Yes					Timber	Somewhat
15	Yes					Timbering	Not at all
16	Yes					Timbering/wood products	Somewhat
17	Yes			Yes		Recreation	Not at all
18	Yes				Drugs	Meth labs, marijuana and wood cutting	Not at all
19	Yes		Yes	Yes	Drugs	Grazing	Somewhat, running cattle and wood cutting
20				Yes		Canoeing	Somewhat
21						None	Not at all
22	Yes		Yes	Yes		Trail rides - horse groups	Not at all
23	Yes		Yes	Yes		Horseback riding	Somewhat
24	Yes	Yes	Yes			Timbering	Very
25	Yes	Yes		Yes		Timbering and mining	Very
26	Yes		Yes	Yes		Timbering and logging	Very
27	Yes			Yes		Timber industry	Somewhat
28	Yes						Somewhat
29	Yes			Yes		Timber	Not at all
30	Yes		Yes	Yes	Support for these activities	Timber	Somewhat

Mark Twain Survey - Law Enforcement

Survey #	Does your county have an agreement with Mark Twain National Forest to patrol the forest in your area?	What are the most pressing problems, from a law enforcement perspective, facing the Forest?	What are the most common criminal activities occurring in the Forest in your area?	From a law enforcement perspective, should access to the Forest be increased-decreased	Explain
1	Yes	Meth labs, illegal drugs (marijuana)	Meth labs	Left alone	
2	No	Meth labs	Meth labs	Neither	
3	Yes	Not many problems in Washington County.	Not much.	Increased	
4	Don't know	Much of area has rugged terrain making it difficult to police.	Potential for portable methamphetamine labs.	Increased	Access would improve visibility allowing for more consistent patrol activity.
5	Yes	Getting to problem areas.	Cooking meth labs.	Decreased	
6	Yes	Drugs, usage and manufacture	Drugs, using and manufacture	Increased	Better surveillance
7	Yes	Drug manufacture and use, littering	Meth labs	Increased	Better surveillance
8	No	Drug manufacture, littering	Drug manufacture		Not many roads in there now, except logging roads
9	No	Drug manufacture and usage, meth labs	Drug manufacture and usage, meth labs	Increased	Better surveillance
10	Yes	Drug manufacture and usage	Drug manufacture and usage	Increased	Better surveillance
11	No	Mobile meth labs	Mobile meth labs	Increased	This is a resource that should be enjoyed by all and would be a way of deterring the use of the forest by marijuana growers and meth cooks. This would also make it easier for local law enforcement to patrol these areas
12	Yes	Meth labs	Meth labs	Increased	
13	Yes	Meth labs	Meth production, marijuana growing	Increased	To better patrol the areas
14	No	Unknown	None		No opinion
15	No	Meth labs, littering, dumping, some poaching	Meth labs and dumping	Increased	To allow better access to law enforcement to stop meth labs
16	No	Trash, illegal activities	Marijuana, meth labs		Should leave about the same as it is
17	No	Use of restricted areas by ATVs, meth labs in hard to access areas	Meth labs, marijuana	Increased	If more people were using forest for activities, less criminal activity would occur more citizens as a "watching eye"
18	Yes	Drug running, damage from ATVs to private property, broken fences, gates	Meth labs, marijuana fields, illegal dumping	Decreased	Or left the same, preferred. If the forest access is closed off, it is then also closed off to the people that respect the forest
19	Yes	Drugs, Trash dumping, Emergency response, difficult to get around to fight fires, find lost people, Private property damage	Drugs, trash dumping	Increased	Search and rescue efforts, More roads would reduce drug activity (easier to see and more traffic)
20	No	Dumping, poaching, drugs	Dumping, poaching, drugs	Increased	
21	No		Poaching		NA
22	Yes	Drug manufacture and usage, littering	Drug manufacture and usage	Increased	Better surveillance by law enforcement and the public
23	Yes	Drug usage, littering	Drug manufacture and usage	Increased	Better surveillance
24	Yes	Meth labs, large areas hard for local law enforcement to patrol	Illegal drugs, stolen contraband, illegal hunting	Increased	Get to where needed
25	Yes	Meth labs, dumping and discarding by-products from meth labs, cooking meth in the forest, storing and biding precursors for meth	Meth labs	Increased	Because the more visitors to the forest, the information we gain on meth operations. If decreased the meth cooks would feel safe and be there anyway
26	Yes	Methamphetamine production, lack of access to remote areas	Marijuana production and meth labs	Increased	Drug producers access remote areas anyway. Improved roads would allow our law enforcement people to better patrol these areas
27	Yes	Too many acres, dumping of trash	Underage partying, drugs		Undecided
28	Yes	Illegal use of existing decommissioned roads for dumps or meth labs	Meth labs	Increased	
29	Yes	Drugs	Drugs	Increased	More access
30					

Mark Twain Survey - General Information

Survey #	Overall, what suggestions do you have for improving the forest in your county?	Overall, what suggestions do you have for improving the forest road system in your county?	Would you like to have a better working relationship with the Mark Twain National Forest?	If yes, explain
1	Insect control infestation, not enough cutting.	Good road system in county. FS needs to continue maintenance	No	Already have a good relationship. They meet with county 1-2 times per year and problems are addressed.
2	Accessible for handicap	Maintenance		We have a good working relationship now
3	All on more timbering and wood cutting permits. Increase number of campground areas. Put in water facilities at existing campsite areas. Berryman/Palmer/Hazel Creek-bathroom.	Leave it alone	No	Have a very good one already. Well pleased with the way they work with county.
4	More parking areas and facilities for disabled citizens to better access the areas.	Maintain existing roads.	Yes	Periodic meetings would help forest managers and county government to better coordinate efforts.
5	They need to work more closely with County Commission. The way it was 10 years ago. They would push out fence rows for wider roads.	The county presently does have an agreement on road improvements.	Yes	
6	Better timber management and roads - Improvement of trails - Better access with better roads.	Let the County maintain them - They have equipment in place.	Yes	Already have good relationship - More personal contact would help.

7	More percentage of timber cutting, more and better access, more food plots for deer and turkey. Timber cutting very important to economy of Shannon County. Needs to be increased.	More roads through forest.	Yes	Good relationship now, but could always improve.
8	Be very careful of any changes that are made. Current system is satisfactory	Would like to leave as is	Yes	No problems, but always room for improvement
9	Designated areas for ATVs, cycling. Designated areas for equestrian. Maps of designated areas. More availability for timer harvest, less restrictions.	Presently well maintained. More access, awareness of local needs.	Yes	Presently have good relationship. Would like to be kept informed of any changes.
10	ATV and dirt bike designated areas and trails	None	Yes	
11	Pay taxes to County or at least help us in taxes	Helping County upkeep County roads	Yes	Would like to talk with them and share ideals with them
12	More management facilities such as select cutting in more areas. Many times harvestable timber is let to die and decay	More roads, better maintenance	Yes	I already have an excellent relationship
13	Better access, more campsites-electric	Better maintenance, no decommissioning of roads	Yes	
14	None	None	Yes	
15	None	None	No	
16	Better roads for roaded areas	More maintenance		It is OK
17	Increase roads and hiking trails, improve maintenance such as grading	Cooperative effort of road maintenance between county and forest service and citizens	Yes	Although we have a great relationship we don't meet often enough to work on these issues

18	Don't close access down because of a small problem. Keep current accesses open. More horseback riding trails	Take care of the existing road system, improve maintenance	Yes	Didn't know they have a relationship. No contact with superintendent. Point of contact is probably through the Sheriffs department for law enforcement purposes
19	Make it user friendly, Make it accessible, Increase maintenance, Increase campsites	Increase maintenance, More roads, Provide maps so that users can find their way to sites (user friendly)	Yes	County commission does not have a relationship with the forest, but should have one
20	Give more thought to habitat for small game	Maintain the roads	No	The relationship seems fine now, if anything is needed feel free to give the commission a call
21	Need a few more roads	A few more roads		
22	Better maintenance of the roads. More access. More cooperation between forest personnel and the County. More snow removal during winter months on main travel ways. More community involvement	Same as above. Better maintenance and road surfacing needed	Yes	More community involvement, more awareness of what local residents need and want
23	More access	Maintenance needs to be more frequent	Yes	Has good relationship with county commission but always room for improvement
24	Need to get back to original idea of using natural resources wisely like they promised, provide jobs, doing only 25% of logging needed. Listening to people who don't know the forests	Better maintenance areas, dollars for maintenance. Logging pay to maintain dollars go to Washington DC does not come back to maintenance in the area	Yes	Need to get back to listening to local folks rather than outside groups. More local forest people are OK to work with, policy is difficult
25	Promote more hunting and legal trails developed	NA	Yes	Have officials attached to local Drug Task Forces, where several acres of forest land are located
26	Provide more timber sales	Open more roads	Yes	I believe the relationship with

	and open roads for greater access			county government is very good now
27			Yes	
28				Already have a good relationship
29	More roads	More roads	Yes	More roads
30	Expand use of prescribed burning; increase camping opportunities; increase marked trails; offer equestrian trails; designate areas for ATVs	Scheduled routine maintenance, access for law enforcement-emergency		

Mark Twain Survey - Comments	
Survey #	Interviewer's comments regarding the interview and commissioner perspective
1	
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4	
5	Overall, the county commissioners were very cooperative and very interested in the subject matter. They emphasized several times the need for better relationship with Forestry SVC.
6	Interviewed Oregon County Commission 10/21/02. All had familiarity and interest in forest activities - Experience with road conditions for county.
7	Commission very familiar, very interested. Do not want to see any road closures.
8	Interested and knowledgeable of forest roads and lands. Like it the way it is
9	Very knowledgeable, very interested.
10	Interviewed Howell County Commissioners in session 10/24/02. Very familiar with forest in Howell County
11	Commissioners were somewhat familiar with certain areas of the national forest.
12	Commissioner Murphy is very familiar with the forest land in the County due in great part to his profession of surveyor and the many years he has practiced his profession
13	Commissioners were fairly familiar with the forest land in their county. Usually were familiar with individual areas of the forest rather than the whole area.
14	Associate commissioner Var Vera was familiar with the national forest land in the County since it is in his district. The other members of the Commission were less familiar with the land
15	Commissioners are not that familiar with the Mark Twain Forest in their County. There are only 4,887 acres of the forest in Ste. Genevieve County. There is one public access road through private and forest service land, approximately 12 miles in length, that the County has a signed maintenance agreement on with the Forest Service.
16	The Commissioners were not impressed with the survey instrument itself. They all seemed to be very informed about the forest in their area, and all said they used it frequently. With the exception of comments regarding improving the existing roads that are used to travel to and from private areas that are locked in by the forest. I think that the Commissioners consider their relationship with the forest to be acceptable and not really needing much change.
17	The Commissioners were not impressed with the survey instrument. This was the first interview that was conducted and many of the questions were hard to respond to in a manner that would give a definitive response. Some questions had to be repeated several times and even then there were still questions as to exactly what was the question (i.e. changes in maintenance - did it mean more or less). The Commission seemed to have a good relationship with the forest agency, and would like to have more opportunities to discuss these matters.
18	The Commissioners found it difficult to respond to some of the questions regarding quality, quantity and type of unroaded/roaded areas, questions were too general. Overall the Commission feels that additional roads are not needed and would likely increase law enforcement problems in some areas. However, their biggest complaint mentioned several times is poor maintenance of existing roads and recreation areas. They would prefer to see improved maintenance of what is there now. They are also opposed to decommissioning roads or closing down existing accesses. To provide a little humor, one commissioner would like turkeys kept out of mushroom patches. Mushroom hunting is apparently a popular activity. They were very definitely opposed to any actions that would increase ATV and motorcycle use of the forest. These users do not stay in designated areas and cause private property damage.
19	Commissioners perspective is that the forest is intended to be used and should be made more accessible. Particularly concerned about difficulty in search and rescue efforts and fire fighting
20	
21	
22	Commissioners very familiar, live near the forest land, they are lifelong residents of Ozark County. They have good relationship with forest service personnel, but have room for improvement
23	Commissioners interviewed in session 10/31/02 - They are very complimentary toward their present relationship with AVA forest service personnel and appreciative of all the forest service has done to help Douglas County
24	
25	
26	
27	Most all of these questions were presented to a group of people at a sporting goods store. Most people had some general feelings.
28	
29	Lots of forest, not enough roads
30	

APPENDIX 6: MAPS

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